

**INFORMATION AND COMMUNICATION TECHNOLOGIES FOR  
KNOWLEDGE MANAGEMENT PROCESSES IN THE PUBLIC SECTOR IN  
KENYA: A CASE STUDY OF THE STATE DEPARTMENT OF  
INFRASTRUCTURE**

BY

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## **ABSTRACT**

Information and Communication Technologies (ICTs) are considered facilitators of knowledge management processes in organizations. This study investigated ICTs for knowledge management processes at the State Department of Infrastructure in Kenya. The study's objectives were to: establish the level of knowledge management awareness, find out knowledge management processes, identify types of ICTs used for knowledge management processes, and identify challenges experienced by State Department of Infrastructure in the use of ICTs for knowledge management processes. The study findings were determined after applying a qualitative research approach and a case study research design. A purposive sampling technique was used to select 21 participants who were heads of sections at the State Department of Infrastructure in Kenya. Data were collected through semi-structured interviews, analyzed and interpreted thematically according to the objectives of the study.

Findings of the study revealed that most participants were aware of the meanings of the concepts of knowledge and knowledge management, types of knowledge and importance of knowledge management in the department. Knowledge management processes in the State Department of Infrastructure entail knowledge creation, codification, retention, sharing and storage. ICTs mostly used for knowledge management processes in the department include: emails, mobile phones, desktop computers, computer servers, and flash disks. The department is faced with the challenges of lack of knowledge management strategies, policies and adequate staff awareness on the use of ICTs for knowledge management processes. In conclusion, the State Department of Infrastructure has a functional ICT infrastructure. However, the department is not using ICTs provided by this study's Web 2.0 driven SECI model for knowledge management processes such as blogs, wikis, LinkedIn, Facebook, and Twitter.

The study therefore proposes that the State Department of Infrastructure should increase its use of Web 2.0 technologies, collaborative content systems and e-learning technologies. The department should also digitize its records; automate its library services; set up intranet, and adopt a centralized knowledge-based system. Further, Public Service

Commission of Kenya should formulate a knowledge management strategy and policy to guide on the use of ICTs for knowledge management processes. This strategy and policy can then be cascaded to public sector organizations such as the State Department of Infrastructure.

## **KEYWORDS**

Information and communication technologies; Kenya; Knowledge; Knowledge Creation; Knowledge management; Knowledge management awareness; Knowledge management processes; Knowledge sharing; Knowledge storage; Public sector; State Department of Infrastructure; Web 2.0.

## DECLARATION

I declare that this study, “**Information and communication technologies for knowledge management processes in the public sector in Kenya: A case study of the State Department of Infrastructure**”, is my own work and that all the sources used or cited in this study have been acknowledged by means of complete references.



**Signature**

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Nancy Mbugua

**5 February 2018**

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Date

## **DEDICATION**

This thesis is dedicated to my children, Wangechi and Thayu.

*“Attitude is a little thing that makes all the difference.”*

Winston Churchill (Prime Minister of the United Kingdom ~ 1874-1965)

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## LIST OF ABBREVIATIONS AND ACRONMYS

A*STAR	Agency for Science Technology and Research
APQC	American Productivity and Quality Center
APO	Asian Productivity Organization
BEL	Bharat Electronic Limited
COP	Community of Practice
DAFF	Department of Agriculture, Forestry and Fisheries
DEWA	Dubai Electricity and Water Authority
E-learning	Electronic learning
E-Government	Electronic government
E-WOM	Electronic Word-of-Mouth
ETD	Electronic Theses and Dissertations
ETMR	<i>Economic and Technology Management Review</i>
EYLP	Early Years Literacy Project
ICTs	Information and Communication Technologies
IE	International Enterprise
IEX	Integrated Employee Exchange
KHDA	Knowledge and Human Development Authority
KIPPRA	Kenya Institute for Public Policy Research And Analysis
KSG	Kenya School of Government
JTAFS	<i>Journal of Tropical Agriculture and Science</i>
MARDI	Malaysian Agricultural Research and Development Institute
NASA	National Aeronautics and Space Administration
OJT	On-Job Training
PGRFA	Plant Genetic Resource for Food
RSS	Really Simple Syndication
RTA	Roads and Transportation Authority
SAP	Systems Application and Products
SECI	Socialization, Externalization, Combination and Internalization
TCPH	Taphanhin Crown Prince Hospital
TNA	Training Needs Assessments

TCP/IP	Transmission Control Protocol/ Internet protocol
UK	United Kingdom
Unisa	University of South Africa
WWW	World Wide Web



## **APPENDICES**

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## **CHAPTER ONE**

### **INTRODUCTION TO THE STUDY**

#### **1.0 Introduction and background of the study**

The public sector is using Information and Communication Technologies (ICTs) for managing its knowledge. The public sector consists of governments and all publicly-controlled or publicly-funded agencies, enterprises, and other entities that deliver public programmes, goods and services (Dube and Danescu 2011:3). An example of a public sector organization is Kenya's State Department of Infrastructure. Knowledge generated in public sector organizations is important in their operations geared to service delivery. These organizations use ICTs to facilitate their knowledge management processes. Knowledge management refers to the acquisition and use of resources to create an environment in which information is accessible to individuals and in which individuals acquire, share and use that information to develop their own knowledge, and are encouraged and enabled to apply their knowledge for the benefit of the organization (Baporikar 2015).

Public sector organizations use ICTs in knowledge management processes involving the creation, storage and sharing of knowledge. For instance, Mosha (2017:201) established that majority of public university librarians in Tanzania share and create knowledge, understanding, experience and skills through the use of Skype and wikis. They also communicate through phones and Google Talk. ICTs improve citizens' experience for services and support, facilitate better quality decisions, enhance institutional memory management, improve internal communication and enhance successful transfer of knowledge.

Mbhalati (2014) highlights the benefits of knowledge management as follows: enhancing the public sector's competence, promoting a healthy environment for e-government programmes, building and leveraging public intellectual property. Further, knowledge management can be used to develop capable knowledge workers, help government

agencies in Africa to improve decision making, enhance working relations and trust within government agencies. McNabb (2006:168) adds that by enhancing the collection, codification, storage, transmission, and sharing of knowledge, the public sector is able to succeed in its mission. This is despite declining budgets, demands for more and improved services, and a skilled and knowledgeable workforce that is disappearing into retirement. McNabb (2006:45) states that in the public sector, knowledge management systems enable organizations to: develop and maintain their ability to identify relevant information needed for completion of their mission; enhance interagency collaborations; store, organize and catalogue invaluable knowledge for reuse.

Various ICTs are used in the creation, retrieval, and transfer processes in public sector knowledge management systems. They include among others, data mining software, electronic learning (e-learning) tools, electronic bulletin boards, intranets, knowledge repositories and directories, databases, and discussion forums revolving around Communities of Practice (COP) (McNabb 2006:50). Newer Web 2.0 technologies and electronic communication tools further enable employees and stakeholders to interact and to work together regardless of their geographical location (Zwain, Teong and Othman 2014:6).

Knowledge management in Kenya is gaining considerable interest in the public sector. The Public Service Commission of Kenya (2015:17) acknowledges that proper knowledge management enhances economic growth and productivity, improves service delivery and supports generation of new ideas. The government of Kenya further recognizes the role played by ICTs in knowledge management. According to the Kenya National Information and Communication Technology Master Plan (2014), ICT is identified as a tool to enhance knowledge economy through ensuring maximum access to information held by public authorities by all Kenyans via consolidated portals in an affordable and secure way.

The government of Kenya has embraced e-government in order to ensure the provision of information and services key to improving productivity, efficiency, effectiveness and governance in all key sectors. In 2013, the government of Kenya set up ‘one-stop shops’

known as Huduma Centres to provide e-government services to the public (Ministry of Public Service, Youth and Gender affairs 2016). Further, the government of Kenya has implemented electronic systems in various state departments and other state-owned institutions to provide services to the public and businesses through government portals (Kenya National Information and Communication Technology Master Plan 2014:31). This study sought to investigate ICTs for knowledge management processes at the State Department of Infrastructure so as to make suggestions on how this may be enhanced.

### **1.1 Contextual setting**

The Ministry of Transport, Infrastructure, Housing, and Urban Development is one of the ministries under the national government of Kenya. Its mandate is to develop and maintain sustainable transport and infrastructure to facilitate efficient movement of goods and people. The ministry is also required to develop and enforce regulations and standards to ensure safe, secure and efficient transport and infrastructure systems. Another obligation of the Ministry of Transport, Infrastructure, Housing, and Urban Development is to undertake research and implement the findings for an efficient transport and infrastructure system. Lastly, the mandate of the ministry is to mobilize resources and build capacity for technical and professional staff. (Ministry of Transport, Infrastructure, Housing, and Urban Development 2017).

The Ministry of Transport, Infrastructure, Housing, and Urban Development consists of the State Departments of Transport, Infrastructure, Housing and Urban Development, Maritime and Shipping Affairs and Public Works. This study focused on the State Department of Infrastructure (Ministry of Transport, Infrastructure, Housing, and Urban Development 2016). The State Department of Infrastructure has several functions such as: development and maintenance of national roads development policy; development, standardization, and maintenance of roads, mechanical and transport services. The department is also responsible for the enforcement of axle load control, materials' testing and advising on the usage, maintenance of roads' security, and protection of road reserves. The State Department of Infrastructure furthermore handles the registration of engineers

and road contractors, development and maintenance of airstrips (Ministry of Transport, Infrastructure, Housing, and Urban Development 2016).

The Ministry of Transport, Infrastructure, Housing, and Urban Development has an ICT infrastructure that might be underutilized in facilitating its knowledge management processes. This could be due to the work environment in the public sector in Kenya. The work environment discourages employees in acquiring, sharing, and managing knowledge at individual and departmental levels nor to network and collaborate or to document tacit knowledge such as lessons learned (Ondari-Okemwa and Smith 2009:35). Therefore, in the Ministry of Transport, Infrastructure, Housing and Urban Development, there might be inadequate mechanisms for knowledge creation and sharing from existing employees and retirees electronically.

## **1.2 Statement of the problem**

ICTs enhance knowledge management processes. Jennex (2010:379) states that the functionalities of ICTs are perceived as significant in shaping organizational efforts for knowledge creation, transfer, and utilization that lead to organizational learning, improvement, and innovation. For increased productivity and efficient service delivery, Kenya is using ICTs in various initiatives such as e-government to deliver knowledge to citizens and businesses. According to the Kenya National Information and Communication Technology Master Plan (2014:72), the vision of e-government is to use ICTs in service provision across all sectors in pursuit of improved service delivery to the citizens and other customers. Survival of e-government is dependent on knowledge availability. Knowledge management provides the overall strategy to manage the content of e-government by providing knowledge, organizing tools and techniques, monitoring currency of knowledge contents, and availing all necessary information to citizens (Gupta and Singh 2014:1639).

The government of Kenya has adopted an e-government strategy involving the use of ICTs to improve its service delivery. However, the use of ICTs in knowledge management processes has not been fully embraced by government ministries in Kenya. As various scholars have noted, ICTs are not fully exploited or integrated with knowledge

management processes (Mungai 2014; Ramohlale 2014; Mosha 2017; Shabane 2017). The Kenya National Information and Communication Technology Master Plan (2014:67) notes that key challenges that are facing the country in its quest to provide e-government services are low automation levels of business processes in State ministries, departments, and agencies. Therefore, many potential benefits of the use of ICTs for knowledge management are yet to be fully realized in government departments in Kenya. This might account for slow information retrieval, decision-making and problem-solving in state departments which ultimately causes delays in information provision and service delivery to citizens. The researcher therefore sought to investigate the use of ICTs for knowledge management processes at the State Department of Infrastructure.

### **1.3 Purpose of the study**

To investigate ICTs for knowledge management processes at the State Department of Infrastructure.

#### **1.3.1 Objectives of the study**

- i. To establish the level of knowledge management awareness at the State Department of Infrastructure.
- ii. To find out knowledge management processes at the State Department of Infrastructure.
- iii. To identify types of ICTs used for knowledge management processes at the State Department of Infrastructure.
- iv. To identify challenges experienced by State Department of Infrastructure in the use of ICTs for knowledge management processes.

#### **1.3.2 Research questions**

- i. What is the level of knowledge management awareness at the State Department of Infrastructure?
- ii. What knowledge management processes are in place at the State Department of Infrastructure?

- iii. What types of ICTs are used for knowledge management processes at the State Department of Infrastructure?
- iv. What are the challenges experienced by State Department of Infrastructure in the use of ICTs for knowledge management processes?

**Table 1.1: Study's objectives, research questions, data collection instruments and data sources**

<b>Research Objectives</b>	<b>Research Questions</b>	<b>Data collection Instruments</b>	<b>Data Sources</b>
i. To establish the level of knowledge management awareness at the State Department of Infrastructure.	What is the level of knowledge management awareness at the State Department of Infrastructure?	Interview guide	Literature review Interview
ii. To find out knowledge management processes at the State Department of Infrastructure.	What knowledge management processes are in place at the State Department of Infrastructure?	Interview guide	Literature review Interview
iii. To identify types of ICTs used for knowledge management processes at the State Department of Infrastructure.	What types of information communication technologies used for knowledge management processes at the State Department of Infrastructure?	Interview guide	Literature review Interview
iv. To identify challenges experienced by the State Department of Infrastructure in the use of ICT for knowledge management.	What are the challenges experienced by the State Department of Infrastructure in the use of ICT for knowledge management processes?	Interview guide	Literature review Interview

### **1.3.3 Justification of the study**

Public organizations have the responsibility to make policies and provide services to citizens. Cong, Li-Hua and Stonehouse (2007:252) say that policy making and service delivery have been the two major tasks of governments. Further, they note that knowledge has been an essential resource for the government and assumes special importance in every step of the process of the business of government. Organizations have also realized the value of knowledge to their efficiency, performance, and competitiveness. Goh, Chua, Luyt and Lee (2008:348) state that knowledge is widely recognized as a strategic asset in improving organizational performance.

For increased productivity and efficient service delivery, the government of Kenya has adopted e-government. Survival of e-government is dependent on knowledge availability. Knowledge management provides the overall strategy to manage the content of e-government by providing knowledge, organizing tools and techniques, monitoring up datedness of knowledge contents and availing all necessary information to citizens (Gupta and Singh 2014:1639).

Few studies have been carried out on knowledge management in the public sector. Although knowledge management has been widely discussed by many academicians and practitioners, there is very little literature on knowledge management in the public sector (Syed-Ikhsan and Rowland 2004:239). This is a research gap that this study sought to overcome by focusing on knowledge management processes in a government agency, namely, the State Department of Infrastructure.

In Kenya, there is limited research conducted on the use of ICTs for knowledge creation, storage, and sharing in the public sector. This study sought to overcome research gaps in past studies in Kenya, which have mostly focused on knowledge management practices (Anduvare, 2015; Kimile, 2015; Gichuhi, 2014; Mungai, 2014; Cheruiyot, Jagongo and Owino, 2012; Mosoti and Masheka, 2010; Ondari-Okemwa and Smith 2009). These studies have not examined how ICTs can enhance knowledge management practices.



Therefore, the findings of the present study go a long way in contributing to scholarship on the use of ICTs in facilitating knowledge management in the public sector in Kenya.

#### **1.3.4 Significance of the study**

The study findings will benefit the State Department of Infrastructure and other public sector organizations as its findings will assist in identifying ICTs for managing their knowledge for improved service delivery. Such ICTs may be used for automating their lessons learnt, best practices, and intellectual capital repositories. This will in turn enhance faster access and retrieval of appropriate information when needed. Further, such repositories will help the public sector to exploit its intellectual assets cheaply and gain a competitive advantage.

Identified ICTs such as document management and e-learning systems, blogs, wikis, expert directories, and mobile devices will enable efficient knowledge sharing and reuse between government employees and other agencies. Further, ICTs such as e-learning and expert systems will facilitate employees' competency development. Consequently, this will enhance decision-making and problem-solving, and overall public sector performance.

The study findings will contribute to the advancement of knowledge on the relationship between ICTs and knowledge management processes in the public sector. The information gathered can also help fellow researchers and students interested in knowledge management. The results of the study can be used to influence policy on knowledge management in the public sector in Kenya and other countries with similar social-economic conditions.

#### **1.4 Definition of terms**

**Knowledge:** A fluid mix of framed experiences, values, contextual information and expert insights that provide a framework for evaluating and incorporating new experiences and information (Davenport and Prusak 1998:5).

**Knowledge management:** Acquisition and use of resources to create an environment in which information is accessible to individuals and in which individuals acquire, share and use that information to develop their own knowledge, and are encouraged and enabled to apply their knowledge for the benefit of the organization (Baporikar 2015).

**Tacit knowledge:** This is action-based and entrenched in practice, and therefore it cannot be easily explained, expressed or described with words or symbols (Nonaka and Takeuchi 1995).

**Explicit knowledge:** This is knowledge that is formal, systematic and which can be codified into records and databases (Polanyi 1966, 1998).

**Knowledge management processes:** Dynamic activities that allow organizations to provide valuable knowledge (Maier and Remus 2002). These processes encompass knowledge creation, codification, retention, sharing and storage.

**Huduma centre:** These are ‘one stop shop’ citizen service centres that provide National Government Services from one single location. (Ministry of Public Service, Youth and Gender Affairs 2016).

### **1.5 Scope and limitations of the study**

The study was limited to the State Department of Infrastructure in the Ministry of Transport, Infrastructure, Housing, and Urban Development in the national government of Kenya. For more conclusive results, all national government ministries should have been studied. However, this was not possible due to limited time of study, financial and other logistic constraints. The proposed study restricted itself to the use of ICTs for knowledge management processes covering knowledge creation, storage, and sharing.

## **1.6 Summary of the chapter**

The focus of this study was to identify types of ICTs for knowledge management processes in the public sector. This chapter has provided a brief overview of the public sector, the importance and role of ICTs for knowledge management in the public sector. The research problem explained the necessity to investigate ICTs for knowledge management in the public sector. The study's purpose, objectives and research questions are provided. The justification and significance of the study are also presented. A brief description of the basic concepts of knowledge management has been provided.

Chapter Two which is the next chapter of the study presents the significance of literature review, theoretical framework, and their relevance to the research. The scope of literature review was guided by the study's objectives which focused on knowledge management awareness, knowledge management process, and ICTs for knowledge management in the public sector. The final objective of the study was on challenges experienced by the public sector in the adoption of ICTs to facilitate knowledge management processes. This chapter concludes by reviewing literature on related works in ICTs for knowledge management processes in the public sector.

## **CHAPTER TWO**

### **LITERATURE REVIEW AND THEORETICAL FRAMEWORK OF THE STUDY**

#### **2.1 Introduction**

This chapter presents literature review that supports the study of ICTs for knowledge management processes in the public sector. This chapter starts with explaining the significance of literature review and theoretical framework, and their relevance to the study. ICTs for knowledge management processes and their challenges are also discussed. The scope of literature review is guided by the study's objectives which focus on knowledge management awareness and knowledge management processes. Further, the objectives focus on ICTs for knowledge management in the public sector and challenges experienced by this sector in the adoption of ICTs for knowledge management processes. This chapter concludes by reviewing literature on related works in ICTs for knowledge management processes in public sector.

#### **2.2 Significance of literature review**

Literature review deals with analyzing materials compiled by researchers and scholars on the related topic under study. Fink (2010) describes literature review as a systematic, explicit, and reproducible method of identifying, evaluating and synthesizing the existing body of completed and recorded work produced by researchers, scholars and practitioners. Bloomberg and Volpe (2012) state that literature review involves locating and assimilating what is already known and entering the conversation from a critical and creative stand point. Bloomberg and Volpe (2012) acknowledge that:

Review of the literature enables you to acquire a full understanding of your topic; what has been already said about it; how ideas related to your topic have been researched, applied, and developed; the key issues surrounding your topic and the main criticisms that have been made regarding work on your topic.

Burton and Bartlett (2011) say that researchers need to access and review existing research, and relevant literature in order to:

- Provide background information on the general area of study;
- Describe and evaluate the context of the research (social, political, economic, educational, environmental, and so on);
- Consider and comment on what has already been written within the general area of investigation, looking particularly at the relationships (differences and similarities) between studies;
- Discuss the relevance of existing research to the research focus and methodology (including any impact on the intended research questions).

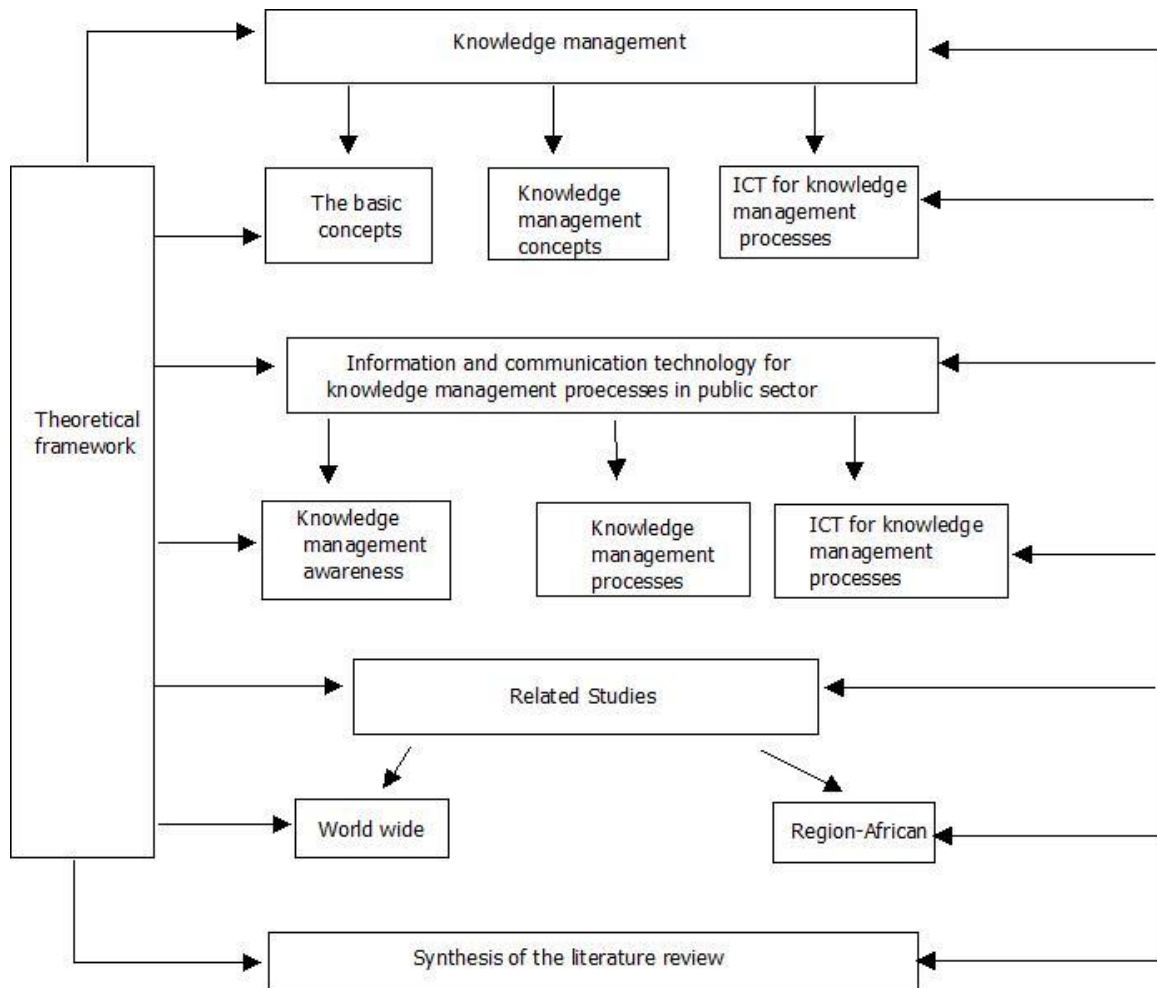
In view of the preceding, this study reviewed literature focusing on ICTs for knowledge management processes in the public sector. The sources reviewed comprised of among others:

- Electronic journals on knowledge management such as: *Journal of Knowledge Management*, *Journal of organizational knowledge management*, *Knowledge and Process Management*, *Knowledge Management Research and Practice*.
- Electronic and printed books in the context of knowledge management and ICTs and research methods. For example, EBSCO Host, ebrary (via ProQuest interface) IGI-Global E-Books, Mylibrary Ebooks, Safari Business and Tech Books Online, Taylor and Francis eBooks.
- Electronic reference sources, for example, *Sage Dictionary of Social Research Methods* and *Encyclopedia of Knowledge Management*.
- Completed research theses and dissertations, for example Unisa electronic theses and dissertations (ETD);
- Subject databases, for example, Emerald Journal, Business Source Complete (via EBSCOHost interface) and SA ePublications, Sage Journals Online, Science Direct (all journal and book titles) Taylor and Francis Online Journals.

### **2.3 Organization of literature review**

Literature review is structured according to the objectives of this study. These objectives are outlined in Chapter One. These objectives were: to establish the level of knowledge

management awareness at the Department of Infrastructure; to find out knowledge management processes at the Department of Infrastructure; to identify types of ICTs used for knowledge management processes at the Department of Infrastructure, and to identify challenges experienced by Department of Infrastructure in the use of ICT for knowledge management processes.



**Figure 2.1: Literature review map**

To assist in bringing together related ideas and organizing literature review, the study used a literature review map presented in Figure 2.1. Creswell (2012) describes a literature map as a figure or drawing that displays the research literature (e.g. studies, essays, books,

chapters, and summaries) on a topic. Creswell (2012) further adds that this visual rendering helps see overlaps in information or major topics in the literature and determine how a proposed study adds to or extends the existing literature rather than duplicates past studies. A literature review map was developed with an aim to outline how the objectives of the study are linked to the theoretical framework that underpins this particular study. The literature review map starts from a general perspective of knowledge management and ends with a more contextualized perspective on the ICTs for knowledge management processes in the public sector.

#### **2.4 Theoretical framework for the study**

This section explains the theoretical foundation for the study. Creswell (2012:121) says that a theory explains and predicts the probable relationship between independent and dependent variables. Creswell (2012:121) further concludes that theories are no more than broad explanations for what we would expect to find when we relate variables. The University of Southern California (2017) explains that theories are formulated to explain, predict, and understand phenomena and, in many cases to challenge and extend existing knowledge within the limits of critical bounding assumption.

Mungai (2014:12) remarks that a theory is sometimes used interchangeably with the term ‘model’ and both terms are seen as explanatory terms. Pediaa (2017) argues that theory and model are two related but distinct terms. A theory can be considered as answers to various problems especially in the scientific world while a model can be considered as a representation created in order to explain a theory. To aid in understanding the theoretical framework for this study, theory will be explained first followed by its (model) graphical representation.

The University of Southern California (2017) explains that theoretical framework is the structure that can hold or support a theory of a research; it introduces and describes the theory that explains why the research problem under study exists. Creswell (2009) agrees that theoretical framework is a logical structure of meaning that guides the development of a study by identifying the key concepts and the relationship among them.

The study applied knowledge creation theory (SECI) by Nonaka and Takeuchi (1995) and The Web 2.0 driven SECI model advanced by Chatti, Klamma, Jarke and Naeve (2007). SECI stands for socialization, externalization, combination, internalization. The use of more than one theory in this study is supported by Ngulube, Mathipa and Gumbo (2015:12) who say that:

A variety of theories may be used when one monolithic theory may be inadequate to explain and describe a multi-faceted phenomenon. Some phenomena may not be amenable to one all-embracing theory. Two or more theories may be used to study one phenomenon in such a way that the theories complement each other. The major difficulty in certain contexts is developing a grand theory for everything.

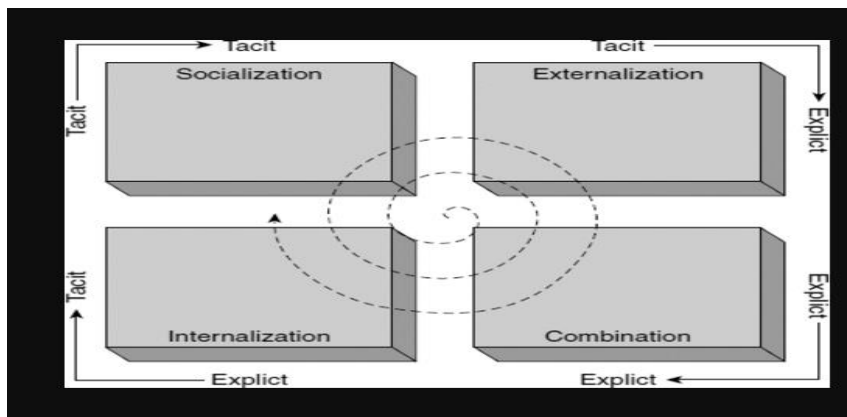
The SECI model explains how tacit and explicit knowledge is converted for use. Gupta and Singh (2014:1639) acknowledge that at public sector level, types of knowledge depend on the functions of the government. Common sources of knowledge in public sector organizations are: visions and strategic plans, government documents, laws, rules and regulations, notifications and archives (Gupta and Singh 2014:1639). A study by Edge (2005) focusing on powerful public sector knowledge management based on a school district example, employed Nonaka and Takeuchi's knowledge creation theory. Edge (2005:46) notes that the theory explores how focusing on tacit knowledge sharing strategies influence early literacy based knowledge creation and sharing within and across schools.

The use of knowledge creation theory in this research provides a basis of understanding the study's second theory referred to as The Web 2.0 driven SECI model. In this model, ICTs are employed to convert tacit knowledge to explicit knowledge and vice versa through knowledge creation modes. Mosha's (2017) study on the application of Web 2.0 tools to enhance knowledge management practices in academic libraries in Tanzania used knowledge creation theory and The Web 2.0 driven SECI model. Mosha (2017:63) argues that the use of SECI model alone could limit the application of Web 2.0 tools to enhance knowledge creation and sharing processes.



### 2.4.1 Knowledge creation/SECI model

In the knowledge creation (SECI) model, tacit knowledge is converted into explicit knowledge and vice versa through four modes namely: Socialization, Externalization, Combination and Internalization (SECI). The model is presented in Figure 2.1. Nonaka and Takeuchi (1995) assert that conversion of the knowledge of employees from its tacit form to explicit form and vice versa are fundamental for knowledge creation and proposed The SECI model of knowledge creation. There are two types of knowledge creation, namely: organizational knowledge creation and individual knowledge creation. Nonaka (1994) explains that organizational knowledge creation as distinct from individual knowledge creation takes place when all the four models of knowledge creation (SECI processes) are organizationally managed to form a continual cycle.



**Figure 2.2 SECI model of organizational knowledge creation**

(Source: Belanger and Slyke 2011)

In socialization mode, knowledge is created between individuals. Socialization happens when we transmit tacit knowledge in our minds to tacit knowledge in other people's minds and share our ways of thinking with others (Allameh and Teimoori 2007:123-152). This knowledge can be created through storytelling, brainstorming discussions and meetings. Zwain, Teong and Othman (2014:5) note that people learn by socializing with others, sharing ideas and exchanging experiences through different means, such as in meetings or discussion forums. Siadat, Hoveida, Abbaszadeh and Moghtadaie (2012:848) recommend that in this mode, experience is an important factor and a useful tool for creating new ideas.

In externalization mode, tacit knowledge is converted into explicit knowledge so that it can be used by everyone. According to Siadat *et al* (2012:848), turning tacit knowledge to explicit knowledge (externalization) is usually achieved through presenting tacit statements and turning them to explicit statements. They further explain that new knowledge can be used by all people, namely: a kind of knowledge which is within us, in our minds and had not been capable of collective presentation and perception is now turned into compiled knowledge, capable to be used by all people. Zwain *et al* (2014:5) agree that in externalization mode, personal knowledge is accumulated, documented and categorized to be available for reuse by others.

In combination mode, explicit knowledge is created using existing coded knowledge. Siadat *et al* (2012:848) confirm that combination of knowledge occurs when there is exchange between two kinds of explicit knowledge. The authors further explain that in combination mode, scientific texts, databases, and statistical banks which are different forms of explicit knowledge are added together and developed. Zwain *et al* (2014:5) recommend that such conversion could be achieved via groupware to create new organizational knowledge. Newly created explicit knowledge can be shared within and outside the organization. Siadat *et al* (2012:848) note an important feature of combination mode, which is that the processed knowledge can be directly introduced to others and published in groups meetings for decision making.

In internalization mode, tacit knowledge is created using explicit knowledge. Siadat *et al* (2012:849) corroborate that internalization is the result of turning explicit knowledge to tacit knowledge. They further explain that this is based on an individual's own mental ability and creativity, and through studying. For example, through scientific materials or hearing scientific view points, a person creates new knowledge which though cannot be shared to others reflects in their behaviours. Zwain *et al* (2014:5) state that people can acquire new knowledge from books, articles from the internet or documented experience of a particular job. Employees can use acquired knowledge to make organizational decisions or use it for creating new products and services. Siadat *et al* (2012:849) assert that changing explicit knowledge to tacit knowledge enables employees to use that

knowledge in their replies and behaviours in a way that they are able to employ that knowledge while facing a situation or problem.

#### 2.4.2 Web 2.0 driven SECI model

Web 2.0 driven SECI model focuses on ICTs for knowledge conversion. Drawn from the learning process, Web 2.0 driven SECI model links ICTs such as wikis, Facebook, blogs, and intranets onto knowledge creation SECI modes. This facilitates socialization, externalization, combination and internalization of knowledge in an organization. According to Chatti *et al* (2007), Web 2.0 driven SECI model is learning process-based. They further add that this model is similar to knowledge creation process, the model is dynamic within a collection of intelligence (Web 2.0 tools) continuous knowledge in action and cyclic conversion of tacit and explicit knowledge.



Figure 2.3: Web 2.0 driven SECI model

(Source: Chatti *et al* 2007)

Chatti *et al* (2007) confirm that Web 2.0 driven SECI model consists of four modes of knowledge conversion, namely: socialization (tacit to tacit); externalization (tacit to explicit); combination (explicit to explicit) and internalization (explicit to tacit). The model also encompasses various Web 2.0 technologies used in conjunction with one another to support each mode of the learning process. Mosha (2017:53) states that the model explains how SECI processes could be combined with various Web 2.0 tools to facilitate knowledge creation and sharing in organizations.

#### **2.4.2.1 Socialization mode**

Web 2.0 technologies facilitate socialization mode by providing ICTs such as blogs, wikis, LinkedIn, Facebook, and Twitter to support online discussions. Chatti *et al* (2007) say that social media provide great opportunities to build such spaces and hand on tacit knowledge from one person to another. Shang, Li, Wu and Hou (2011:179) add that on a Web 2.0 platform, socialization occurs when individuals or groups share methods, understanding, experiences, and skills through observation, imitation, practice, and participation in different social media.

Wagner, David and Wagner (2014:34) underline that Web 2.0 influence organizational knowledge creation across SECI components. In socialization mode, these authors note that Web 2.0 provides a platform for human interaction and collaboration where individuals may be virtually co- present and observe each other. They further state that this is achieved through connections made on social network sites, organizational profiling networks, and wiki edits. Further, this can be achieved through identification of people whose interests match certain tags may provide information about where expertise is located within an organization or a Community of Practice (COP).

#### **2.4.2.2 Externalization mode**

Web 2.0 technologies such as blogs and wikis support codification of tacit knowledge to explicit knowledge as explained under section 2.9.1 in this study. Chatti *et al* (2007) state that discussions around a blog post through comments and trackbacks give more contexts

to codified knowledge. They add that recording of phone/video-conferences and instant messaging sessions support online capturing of context-rich knowledge as it gets created.

#### **2.4.2.3 Combination mode**

Combination mode entails conversion of explicit knowledge into explicit knowledge. Web 2.0 technologies such as mashup, blogs, Really Simple Syndication (RSS) feeds, support this mode. Chatti *et al* (2007) explain that Web 2.0 technologies such as mashup can be used to pull together content from more than one source, remix and assemble it to form a new service. Further, they state that RSS is a successful technology that makes it easy to share resources across networks. This is because it brings content from different sources (e.g. new blog posts and podcasts) to a learner's personal space once she has subscribed to the feed source. Shang *et al* (2011:179) note that some Web 2.0 technologies, such as RSS, folksonomies, and mashup are good examples of combining and remixing knowledge to form new knowledge.

#### **2.4.2.4 Internalization mode**

Internalization mode involves the conversion of explicit knowledge to tacit knowledge. Nazim and Mukherjee (2016) assert that this mode entails shared understanding and prescriptions. For example, agreed routines which have been developed through earlier modes of knowledge creation providing a context for individuals to convert explicit knowledge into embodied tacit knowledge. Web 2.0 facilitates this mode by providing co-authoring tools such as wikis and blogs. Shang *et al* (2011:179) are of the view that Web 2.0 functionalities such as content editing and co-development can provide platforms for co-creation among participants. This facilitates knowledge internalization through reflection on what has been learned. It is evident that ICTs aid in conversion of tacit and explicit knowledge, facilitates its storage and sharing in organizations. Section 2.9 of this research expounds more on how ICT tools are used for knowledge management processes.

## **2.5 Link between theoretical framework and statement of the problem of the study**

The State Department of Infrastructure seems not to be using ICTs for knowledge creation, storage and sharing. One of the key challenges facing Kenya's quest to provide e-government services is low automation levels of business processes in government ministries, departments, and agencies (Kenya National Information and Communication Technology Master Plan 2014:67). Survival of e-government is dependent on knowledge availability. Knowledge management gives the overall strategy to manage the content of e-government by providing knowledge, organizing tools and techniques, monitoring up datedness of knowledge contents and availing all necessary information to citizens (Gupta and Singh 2014:1639).

The knowledge creation (SECI) model explains how knowledge is created and shared within the organization through socialization, externalization, combination, and internalization modes. On the other hand, Web 2.0 driven SECI model explains how ICTs are used to facilitate knowledge creation, storage and sharing. Shang *et al* (2011:178) explain that the Web 2.0 driven SECI Model helps to understand how Web 2.0 technologies impact knowledge management processes for strategic source for service growth and sustained advantage. The theoretical framework informed literature review.

The scope of literature review in this study was guided by the study's objectives with themes such as knowledge management awareness, knowledge management process, ICTs for knowledge management in public sector and challenges experienced by public sector in the adoption of ICTs to facilitate knowledge management processes.

## **2.6 Basic concepts of knowledge management**

In this section, the study defines and explains various concepts, their perspectives and how they relate to knowledge management. The explanations offered facilitate understanding of the concepts as the researcher responds to the study's objectives.

### **2.6.1 Knowledge**

There is no agreed definition of the term "knowledge". There has not been a unanimous conclusion to the definition of knowledge at present (Wu *et al* 2011; Fombad 2014:61).

Knowledge is something that is not easily visible and expressible, it is highly personal and hard to formalize making it hard to communicate or share it with others (Nonaka and Takeuchi 1998:8). On the other hand, Davenport and Prusak (1998:5) define knowledge as a fluid mix of framed experiences, values, contextual information and expert insight that provide a framework for evaluating and incorporating new experiences and information. Knowledge is an abstraction from action because it enables actions or performance but in itself is not valuable and requires application to enhance performance (Coleman and Casselman 2016:938). For clarity purposes, this study adopted the definition of knowledge advanced by Davenport and Prusak (1998).

Organizations have realized the value of knowledge as an intangible resource for their economic success. Crane (2015) states that knowledge has come to be seen as a firm's most precious asset. It is the key to new product and service development, essential to understanding customers and market trends, and the principle ingredient to innovation. Green (2014:9) also confirms that it has been accepted that knowledge drives productivity and profitability and it is growing in importance beyond this as access to it broadens and deepens. Lottering and Dick (2012:1) add that there is a consensus that a more enduring and reliable success factor is knowledge.

Countries have also realized the value of knowledge in economic and social development. The World Bank (2012) notes that knowledge is an important asset for countries. It offers potential for economic and social development by providing low cost and effective ways for service provision and production of goods while leading to globalization and competitiveness internationally. Prusak (2001:1005) acknowledge that in the emerging economy, a firm's only advantage is its ability to leverage and utilize its knowledge. There is evident that there is no agreed definition of what knowledge is however, its importance to organizations is recognized and acknowledged.

Knowledge is viewed differently by various authors. Therefore, there exist different approaches of knowledge that highlight definitional ambiguity surrounding the concept. Fombad (2008:45) confirms that there are different perspectives of knowledge considered

in the spirit of accepting a wide range of views as possible rather than attempting to prescribe to a particular meaning to knowledge. As such, we have data, information and knowledge, individual, social and organizational perspectives (Fombad 2014:61). This study focused on these four perspectives.

#### **2.6.1.1 Data, information and knowledge perspective**

Data are raw facts. Bali, Wickramasinghe, and Lehaney (2009) describe data as a series of discrete events, observations, measurements or facts that can take the form of numbers, sounds and images. Further, they state that when data is processed and organized into a context it becomes information. On the other hand, information is processed data. Bali *et al* (2009) describe information as data that has been arranged into a meaningful pattern with a recognizable shape. This implies that data has been endowed with relevance and purpose.

Knowledge is contextualized information. Young and Milton (2011) state that knowledge has something that data and information lack and those extra ingredients are the experiences and the heuristics (rules of thumb). They further note that knowledge is situational and leads to actions. This study focused on this perspective as it is related to the study's purpose of investigating ICTs for knowledge management processes at the State Department of Infrastructure. According to Nazim and Mukherjee (2016), ICT provides organizations with a wide range of tools to support their employees in organizing, searching and sharing knowledge.

#### **2.6.1.2 Individual/personal knowledge perspective**

Individuals generate knowledge and they own it. The original form of knowing is individual knowledge which is based on a mix of formal education and personal experiences (Tryon 2012:32). Knowledge can exist as an object in essentially two forms. First, explicit knowledge which is typically written or documented knowledge. Second, tacit knowledge or know-how which typically resides in people heads (Polanyi 1966).



### **2.6.1.3 Social knowledge perspective**

Knowledge is created when employees interact during meetings. Liebowitz (2016) points out that social knowledge is the information created through interaction. The author further indicates that valuable knowledge is generated when people communicate to formulate ideas or solve problems. Na (2015:13) adds that social knowledge exists in relationships among individuals or within groups. Such knowledge is largely tacit and it is composed of cultural norms that exist as a result of working together and is reflected in our ability to collaborate and develop transactional relationships.

### **2.6.1.4 Organizational knowledge perspective**

Organizational knowledge is a formal integrated application of knowledge beliefs and knowledge processes to an institution's data, information and decision making within a specific subset of an enterprise (Tryson 2012:33). According to Bhatt (2001), organizational knowledge is formed through unique patterns of interactions between technologies, techniques, and people. Such knowledge cannot be easily imitated by other organizations because these interactions are shaped by the institution's unique history and culture. Once this knowledge is formed, Na (2015:13) adds that it is embedded in organizational systems, processes, rules and routines.

## **2.6.2 Categories of knowledge**

According to Nonaka (1995), there are two types of knowledge namely: tacit and explicit knowledge. Jain and Jeppesen (2013:348) agree that organizational knowledge exists in the form of explicit knowledge and tacit knowledge. Explicit knowledge is codified and can be stored in both soft and hard copies. Nonaka (1995) states that explicit knowledge can be described as knowledge that is easily coded, transferred and shared within an organization. Explicit knowledge is defined by Polanyi (1966, 1998) as knowledge that is formal, systematic and can be codified into records, databases.

King (2009:4) explains that explicit knowledge exists in the form of words, sentences, documents, organized data, computer programs, and other explicit forms. He further notes that knowledge-related assets include knowledge in the form of printed documents, such

as patents and manuals and knowledge stored in electronic repositories such as “best practices” database. Such a database contains employees’ knowledge about the best way to do their jobs. This knowledge is held by teams that have been working on focused problems. Further, this knowledge is embedded in the organizations’ products, processes and relationships. Alavi and Leidner (2001:110) add that explicit knowledge is articulated, codified, and communicated in symbolic form/or natural language.

Tacit knowledge is uncoded and it is held in human being’s mind. Polanyi (1966, 1998) defines tacit knowledge as knowledge that is personal, intangible and embedded in the cognitive minds of people and is obtained through learning and experience. Nonaka and Takeuchi (1995) define tacit knowledge as action-based and entrenched in practice and therefore it cannot be easily explained, expressed or described with words or symbols. Tacit knowledge is personal in origin, job specific, related in context, difficulty to fully articulate, and poorly documented but highly operational in the minds of the possessor (Serban and Luan 2002:9).

To effectively utilize tacit knowledge, the owner/holder must be willing to share it. Dalkir (2006:8) and Uriarte (2008:5) demonstrate that sharing of tacit knowledge in an organization is a challenge because it is difficult to formalize, articulate or locate it. Uriarte (2008:5) advises that it is important for an organization to discover, propagate and utilize tacit knowledge of its employees in order to optimize the use of its own intellectual capital.

The preceding discussion shows that organizations generate two types of knowledge, namely: tacit and explicit knowledge. It is also noted that the knowledge is of value especially tacit knowledge which is also hard to articulate. Therefore, there is need to devise ways of managing knowledge more especially tacit knowledge so that organizations can exploit its benefits.

### **2.6.3 Knowledge management**

There is no agreed definition of knowledge management. Na (2015) explains that lack of a common definition of knowledge management is due to the fact that knowledge is a complex, multidisciplinary and philosophical concept. He adds that lack of common

definition of knowledge management is also the case with the term ‘firm’. This is because knowledge management can be viewed differently by various people depending on their experience, background and seniority in knowledge management within an organization.

**Table 2.1: Definitions of knowledge management**

<b>Researcher</b>	<b>Definitions</b>
Blair (1997)	Knowledge management aims to capture the knowledge that employees really need in a central repository and filter out the surplus.
Gore and Gore (1997)	Creating an association between knowledge and action and managing the organizational change resulting from that association.
Duffy (2000)	A process that drives innovation by capitalizing on organizational intellect and experience.
Dunn (2004)	The policy and processes, through which organizations seek to create, capture, store, disseminate and leverage organizational knowledge.
Claver-Corte´s, Zaragoza-Sa´ez and Pertusa-Ortega (2007)	Knowledge management is a set of business policies and actions undertaken for the purpose of favoring creation of knowledge, its transfer to members and its subsequent application with a view of achieving distinctive competitiveness which can give a company a long term competitive advantage
Khademi, Kabir and Haghshenas (2011)	Knowledge management is the planning, organizing, motivating, and controlling of people, processes and systems in the organization to ensure that its knowledge related assets are improved and effectively employed.
Baporikar (2015)	Knowledge management as the acquisition and use of resources to create an environment in which information is accessible to individuals and in which individuals acquire, share and use that information to develop their own knowledge, and are encouraged and enabled to apply their knowledge for the benefit of the organization.

As seen in Table 2.1, knowledge management has been defined differently by various authors. These definitions assist in understanding and appreciating that knowledge

management is defined differently in organizations. In a nutshell, knowledge management encompasses the processes used for creating, storing, sharing, using and reusing organizational knowledge. These processes are facilitated or enabled by ICTs for competitive advantage.

Knowledge management draws upon a vast number of diverse fields. Dalkir (2011:6) points out that one of the few areas of consensus is that knowledge management is a highly multidisciplinary field. Nazim and Mukherjee (2016) note that there are many disciplines taking an interest in knowledge management and each one has its own approach for managing knowledge. Bukowitz and Williams (1999) opine that knowledge management is a fast-moving field created by the collision of several others, including human resources management, organizational development, change management, information technology, brand and reputation management, performance measurement, and evaluation.

According to Dalkir (2011:7), knowledge management draws upon a vast number of diverse fields such as: organizational science; cognitive science; linguistics and computational linguistics; information technologies; information and library science; technical writing and journalism; anthropology and sociology; education and training; storytelling and communication studies and collaborative technologies. The author acknowledges that this list is by no means exhaustive but it serves to show the extremely varied roots that gave life to knowledge management and continues to be its basis today. Some of the information technologies applied in knowledge management are: knowledge based systems, document and information management, electronic performance support systems, and database technologies. Collaborative technologies upon which knowledge management draws include among others, computer supported collaborative work and groupware, as well as intranets, extranets, portals, and other Web-technologies. Knowledge management include: intellectual, individual, social, technology, cultural, and organizational perspectives that provide a basis of understanding its meaning (Fombad 2008; Nazim and Mukherjee 2016; Alavi and Leidener 1999). This study focuses on social, organizational, technological, and people/human based perspectives of knowledge management.

### **2.6.3.1 Social-based perspective of knowledge management**

Social-based perspective of knowledge management is important for this study as it assists in understanding that knowledge is/can be generated through the interactions of groups or teams and it is codified for use within an organization. Social interactions play an important role in knowledge management in terms of knowledge creation and sharing. Liebowitz (2016) states that social knowledge management works to facilitate and demonstrate how knowledge assets can be (re)used effectively. This contributes to the success of communicating with connected organizations.

Khademi *et al* (2011) say that knowledge assets include knowledge in the form of printed documents such as patents and manuals. Knowledge assets also consist of knowledge stored in electronic repositories such as a “best-practices” database. Such databases entail employees’ knowledge about the best way to do their jobs, knowledge that is held by teams who have been working on focused problems, and knowledge that is embedded in the organization’s products, processes and relationships.

### **2.6.3.2 Organizational-based perspective of knowledge management**

Organizational-based perspective of knowledge management aids in understanding that some factors should be provided for knowledge management to thrive or take place. Such factors include: culture, technology, and knowledge processes. This perspective considers the relationship between knowledge infrastructure capability and knowledge management processes towards knowledge management capability.

Makore (2015:29) states that the organizational perspective of knowledge management proposes that a knowledge infrastructure is made up of structure, culture, and technology together with knowledge process architecture. This architecture comprises of acquisition, conversion, application and protection as vital organizational competencies or preconditions for effective knowledge management.

### **2.6.3.3 Technological-based perspective of knowledge management**

Technology-based perspective of knowledge management focuses on ICTs as a key factor in knowledge management. This perspective clarifies the role of ICTs in knowledge management. This viewpoint focuses on information management, information systems, databases, hardware, software and communication tools (Alavi and Leidner 1999; Fombad 2008). According to Bhatt (2001), majority of business managers argue that information technology can provide an edge in harvesting knowledge from piles of old buried data repositories. These repositories consist of point of sale, customers' credit cards, promotional sales and seasonal discount data.

Fombad (2008) opines that technology-based perspective seems to oversimplify the concept of knowledge management. This is because knowledge management is not only about the use of technology to manage information. Further, she states that technology remains a knowledge management enabler rather than a central tenet at the heart of it. This implies that ICTs facilitate knowledge management processes. In agreement, Handzic (2011:206) and Nazim and Mukherjee (2016) note that ICT is a significant knowledge management enabler through technological infrastructure. This infrastructure provides a platform for knowledge creation, storage and sharing.

Bhatt (2001) argues that defining knowledge management through technological or social systems alone endangers bias in overemphasizing one aspect at the expense of the other. This study focused on technology-perspective of knowledge management as it considered ICTs are considered as knowledge management enablers. This is supported by the study's objectives that sought to identify types of ICTs used for knowledge management processes at the State Department of Infrastructure and challenges faced in this endeavor.

### **2.6.3.4 The people/human-based perspective of knowledge management**

Human beings are the owners of knowledge. Nazim and Mukherjee (2016) note that the people/human-based perspective of knowledge management focuses mainly on management of people who are ultimate sources of knowledge. They further show that a great amount of knowledge in organizations is tacit in nature. Thus, it is embedded in

human skills, expertise and know-how of people. Consequently, capitalizing on these assets is essential in making knowledge management efforts successful. This perspective is important for the current study as it highlights people as key elements of knowledge management as they are the sources of tacit knowledge in organizations.

## **2.7 Knowledge management awareness in the public sector**

This section reviews literature on knowledge management awareness in the public sector. The section focuses on reviewing literature demonstrating the extent to which public sector officers/workers and departments understand knowledge and knowledge management in their organizations. The section provides an overview of the public sector and expounds on how public sector staff understand knowledge and knowledge management. The section also highlights knowledge management awareness in various regions, namely: the United States of America, Europe (focusing on United Kingdom); Asia (involving Malaysia and Dubai) and Africa (concentrating on Tanzania, South Africa, Nigeria and Kenya).

McNabb (2006:11) defines public sector as the functioning agencies and units at the federal state, county, municipal and local levels of governments. The author further indicates that the public sector includes all agencies, government corporations, the military, departments, and miscellaneous units that perform some form of public service. According Sullivan (2011), the public sector refers to the government, including departments, agencies, commissions, and government corporations, and the non-profit sector, plus both member-serving organizations and public-serving organizations.

Privacysense (2016) says that the public sector is usually comprised of organizations that are owned and operated by the government and exist to provide services for its citizens, and they do not seek to generate a profit. Examples of public sector organizations include: education (e.g. public schools and libraries) electricity, emergency services, fire service, gas and oil, healthcare, infrastructure, law, enforcement, police services, postal service, public transit, social services, and waste management (Privacysense 2016). The United Nations Public Administration Network (2008:1) acknowledges that lack of a particular product and “non-profit-seeking” purpose sometimes make the result of government work very hard to measure. In government decision settings, there are many parties and opinions that have to be considered before making a final decision. In addition, multiple actors and

stakeholders (general public, direct clients, media, interest groups, and legislature) provide competing feedback which in turn makes the decision process even more complex. Lastly, the management team in public organizations often faces more visibility and scrutiny which aids in getting a message to the public quickly.

The role of the public sector is to make laws and policies, and avail them to citizens for decision making. The United Nations Public Administration Network (2008:3) acknowledges that the public sector is one of the biggest producers and consumers of information and knowledge. Thus, given both its policy making role and interest in promoting knowledge for human development, the government can act as a knowledge broker. Further, the work of the public sector relates to every aspect of social lives and every citizen is the ultimate customer of the government (United Nations Public Administration network 2008:3).

The public sector manages its knowledge by focusing on its use in improving products and services delivered to citizens in order to improve their quality of life and wellness (Blackman and Denner 2013:7). The Asian Productivity Organization (APO) (2013:5) identifies several factors motivating the establishment of knowledge management in the public sector as follows:

- To drive efficiencies across all public services. For instance, by connecting silos of information across different levels of government and across borders;
- To develop new or consolidating outdated systems to improve overall performance and capitalize on a broader, more integrated, and accessible knowledge base;
- To improve accountability and mitigate risk by making informed decisions and resolving issues faster supported by access to integrated, transparent information across all organizational boundaries;
- Lastly, to deliver better and more cost-effective constituent services such as enhancing partnership with and responsiveness to the public, thereby clearly demonstrating higher returns on taxpayers' money.



European public sector organizations are aware of the role played by knowledge and knowledge management. The National Aeronautics and Space Administration (NASA) is a United States of America government agency that is responsible for science and technology related to air and space. NASA as an organization is aware of the role played by knowledge. According to Roger (2009:1), NASA's Chief Knowledge Officer, people at the organization have developed many practices and behaviour that enable them to learn and reapply knowledge. Roger (2009:2) adds that at NASA, there are databases of lessons learned, near misses, safety anomalies and mishap reports which contain valuable information. NASA has learning activities like seminars, workshops, interactive training, retreats and job rotations that enhance the richness of the organization (Roger 2009:2).

Barquin (2011) states that the United States of America Army has been paying attention to knowledge management through creation of the Army Knowledge Management Strategy. This strategy seeks to transform the Army into a network-centric and knowledge-based force. Syed-Ikhsan and Rowland (2005:243) point out that in managing knowledge in an organization, it is very important to have a knowledge management strategy that is well understood by all employees. Further, they explain that this enables employees to know their individual roles or their roles with other employees. It also keeps employees aware of the kinds of knowledge that need to be managed and shared by them.

Barquin (2011) states that there are United States of America Army knowledge principles whose objective is to connect those who know with those who need to know (know-why, know-what, know-who, and know-how). This is achieved by leveraging knowledge transfers from one-to-many across the Global Army Enterprise. These principles are presented in three bundles corresponding to three different knowledge management dimensions: people/culture dimension, process dimension and technology dimension (Barquin 2011).

The United States of America Army knowledge principles identified by Barquin (2011) are as follows:

### **1. People/culture dimension**

- Principle 1: Train and educate knowledge management leaders, managers, and champions;
- Principle 2: Reward knowledge sharing and make knowledge management career rewarding;
- Principle 3: Establish a doctrine of collaboration;
- Principle 4: Use every interaction, whether face-to-face or virtual, as an opportunity to acquire and share knowledge;
- Principle 5: Prevent knowledge loss.

### **2. Process dimension**

- Principle 6: Protect and secure information and knowledge assets;
- Principle 7: Embed knowledge assets (links, podcasts, videos, documents, simulations, and wikis) in standard business processes, and provide access to those who need to know;
- Principle 8: Use legal and standard business rules and processes across the enterprise.

### **3. Technology Dimension**

- Principle 9: Use standardized collaborative tool sets;
- Principle 10: Use open architectures to permit access and searching across boundaries;
- Principle 11: Use a robust search capability to access contextual knowledge and store content for discovery;
- Principle 12: Use portals that permit single sign-on and authentication across the global enterprise including partners.

By having a knowledge management strategy and documenting knowledge management principles, it is evident that the United States of America Army is aware of the role played by knowledge management in its operations. According to Syed-Ikhsan and Rowland (2005:243), having a well-defined knowledge management strategy benefits the

organization as a whole. It allows organizations to access and store information and knowledge in both the system and people's heads.

Seba and Rowley (2010) carried out a study to investigate strategies, policies, initiatives, programmes, and practices relevant to the implementation of knowledge management in United Kingdom (UK) police forces. It was established that none of the UK police forces had an overarching knowledge management strategy or policy. Indeed, none of the UK police forces had a strategy under the title "knowledge management strategy". Despite the absence of a knowledge management strategy, Seba and Rowley (2010) noted that all UK police forces were aware of the importance of knowledge management. Additionally, the UK police forces were engaged in specific and tailored initiatives. These initiatives included: management information strategy, review system, knowledge management center, and standard operating procedure that helped to develop strategies or structures relating to knowledge management.

Syed-Ikhsan and Rowland (2005:243) examined the availability of a knowledge management strategy in a public organization in Malaysia. The study was based on the Ministry of Entrepreneur Development of Malaysia. The researchers established that 52.6 per cent of the participants were aware that the Ministry had a knowledge management strategy. The results of the study also indicated that there were officers who were not aware of existence of a knowledge management strategy.

Biygautane and Al- Yahya (2010) observe that Dubai government entities such as Dubai Electricity and Water Authority (DEWA), Dubai Courts, Knowledge and Human Development Authority (KHDA), Roads and Transportation Authority (RTA) and Dubai Police have incorporated knowledge management into their organizations. These agencies have integrated knowledge management in their agencies so as to enhance their organizational performance, improve internal efficiency and service delivery. This integration also seeks to facilitate communication among individuals and departments within or outside their organizations, and to better store their knowledge capital through proper mechanisms.

Shajera, and Al-Bastaki (2014) advise that if knowledge management is implemented effectively in the public sector, it improves organizational performance through increased efficiency, productivity, quality and innovation. This ultimately leads to better decision making, streamlined processes and reduced re-work. It also increases data integrity and greater collaboration through increased access to employees' knowledge.

A study by Mosha (2017:269) established that there is lack of knowledge management awareness among the majority of library staff in public universities in Tanzania. The researcher noted that despite the fact that the application of knowledge management is somewhat new, most of the academic libraries in Tanzania do not take it seriously. However, the academic libraries are making all efforts to apply knowledge management processes to improve their information services. Mosha (2017:273) also found out that knowledge management processes such as knowledge creation and sharing have been conducted in the majority of the academic libraries in Tanzania unknowingly.

Knowledge management is not institutionalized in the South African public service. Shabane (2017:166) conducted a study to establish whether talent management and knowledge management are integrated and whether this supports staff retention in the South African public service. The researcher found out that knowledge management was not institutionalized and it was applied in an ad hoc manner. The South African public service senior managers and middle managers were not aware of how their departments defined the concept of knowledge management and if it was practised. Further, the participants' departments did have an approved knowledge management policy. However, the study established that senior managers and a few middle managers in the South African public service provided their own definitions based on their understanding. Indeed, very few senior and middle managers gave a definition of knowledge management that closely matched that their organizations' performance management and development policy.

The study by Shabane (2017:165) observed that even though there is no formal approved policy for knowledge management, there were various initiatives used by the South African

public service to share knowledge. These include information sessions and networking involving meetings, workshops and brown bag sessions. Organizational minutes, reports and submissions were also used as mechanisms to share knowledge. E-mails and the intranet were also used for knowledge sharing. However, Shabane (2017:165) noted that the South African public service fails to document knowledge generated by its employees.

A research was conducted by Romohlale (2014:142) on knowledge management practices at the Department of Defense in South Africa. It was established that knowledge management was not structured, developed or supported. There was no professional unit mandated to manage the intellectual capital of the department. This was because knowledge management practices and knowledge management as phenomenon were not that well known and understood. Romohlale (2014:142) concludes that if at all the Department of Defense of South Africa was robust in knowledge management, most of participants would not have had a problem understanding or talking about knowledge management.

Knowledge management awareness in Nigerian universities seems to be low. Ohiorenaye and Eboreime (2014:401) conducted a study on knowledge management practices and performance in Nigeria universities. The study findings revealed that coaching and mentoring programmes, improving document and records management, facilitating skills transfer from retiring staff, and capturing staff knowledge in a documented form may not be sufficiently done. Further, it was determined that improving policies and procedures, implementing new learning approaches including e-learning, and enhancing the corporate staff directory though essential were also absent in some universities (Ohiorenaye and Eboreime 2014:401).

The study by Ohiorenaye and Eboreime (2014:401) noted that most university libraries in Nigeria were not well equipped for storing knowledge and they did not have recent and current books and journals. The researchers also established that e-libraries were not developed. This impeded knowledge storing and sharing. The study further determined that university libraries in Nigeria lacked knowledge management processes such as knowledge

creation, storage and sharing. Therefore, it was recommended that Nigerian universities should encourage sharing of knowledge through COPs, identify and use best practices, and knowledge harvesting (Ohioyenoye and Eboreime 2014:412).

Ekeke's (2011) research on knowledge management in the Nigerian Public Service established that public servants were aware about knowledge needed to run the public sector. This was more especially in the area of routine administrative knowledge used in handling scheduling duties and for decision making. The study findings also revealed that the Nigerian Public Service transfers knowledge among public officers and departments using various methods such as mentoring and discussions.

Ekeke (2011:260) established that in the Nigerian Public Service, knowledge transfer was done informally, and that the mechanisms used for the transfer of tacit knowledge were different from those applied for explicit knowledge. For tacit knowledge, mechanisms such as face- to- face conversations, mentoring, storytelling and posting of staff from one department to another were more effectively used for knowledge transfer. In the case of explicit knowledge, minutes in files conveying management decisions, memos and minutes of meetings were the most applied mechanisms during knowledge transfer (Ekeke 2011:260). The findings of the research further revealed that other mechanisms such as brainstorming, induction, feedback and formal training were employed in knowledge transfer. However, these mechanisms were not effectively used as those already mentioned.

Knowledge management awareness in the Kenyan public sector seems to be low. This is noted by Onderi-Okemwa and Smith (2009) who state that knowledge management has not yet been adequately integrated into the Kenyan civil service. Therefore, the benefits of knowledge management cannot be realized until such time that sufficient integration has taken place. Mungai's (2014:94) study established that the Kenya Institute for Public Policy Research and Analysis (KIPPRA) values knowledge as an asset but it was not practising tacit knowledge management. However, the researcher noted that both tacit and explicit knowledge were available at KIPPRA. This implies that no real efforts had gone into the management of tacit knowledge at KIPPRA.

Onderi–Okemwa and Smith (2009) state that it is crucial that any knowledge management programme should take into account both tacit and explicit knowledge, and the dominant managerial model of governance. Mungai’s (2014:94) study found out that KIPPRA had tacit knowledge sharing, capturing, transferring and storage avenues that have not been capitalized on. Onderi-Okemwa and Smith (2009) further note that in the Kenyan civil service, a number of impediments impact on the effective generation, processing and sharing of knowledge required to enhance performance and service delivery. Some public sector organizations are seemingly not aware of knowledge management and they are managing their knowledge unknowingly through knowledge creation, storage and sharing. The current study focused on ICTs for knowledge management processes in the public sector in Kenya based on a case study of the State Department of Infrastructure.

## **2.8 Knowledge management processes in the public sector**

This section provides an overview of knowledge management processes as applied generally in organizations and the importance of knowledge management. The section also focuses on knowledge management processes in public sector organizations. This discussion is important for this study as it provides an understanding of knowledge management processes which are or should be facilitated by ICTs. This study discusses three knowledge management processes, namely: knowledge creation, storage and sharing.

**Table 2.2: Grouping of different definitions knowledge management processes**

<b>Authors</b>	<b>Knowledge management activities</b>
Nonaka and Takeuchi (1995)	Socialization, externalization, combination, internalization
Bhatt (2001)	Knowledge creation, validation, presentation, distribution and application.
McNabb (2006)	Knowledge acquisition, sharing and knowledge utilization
Sun (2010:508)	Knowledge acquisition, utilization, and sharing
Zwain <i>et al</i> (2014:5)	Knowledge creation, capture, organization, storage, dissemination, and application.
Tubigi and Alshawhi (2015:182)	Knowledge creation and acquisition, modification, usage, archiving, transfer, and translation, user access to knowledge and knowledge disposal.

Organizations have appreciated the role played by knowledge in their operations. The pressure of global competition, increasing product complexity, relevant technology progress, and strong customer orientation has gradually forced companies to improve their capability to create and deliver value (Schiuma, Carlucci, and Lerro 2012:5). Therefore, institutions have put in place methods of organizing their tacit and explicit knowledge. The importance attributed to the deployment and exploitation of knowledge resources to support and drive organizations' performance improvement is proved by (Schiuma *et al* 2012:5). These authors point out that in the last decades, many companies implemented knowledge management initiatives. Table 2.2 summarizes different definitions of knowledge management processes.

Knowledge management processes are methods used by organizations to acquire, capture, store, share and disseminate and apply their tacit and explicit knowledge. Khademi *et al* (2011) note that knowledge management processes involve knowledge acquisition, creation, refinement, storage, transfer, sharing, and utilization. Further, they state that knowledge management function in organizations operates these processes, develops methodologies, and systems to support them, and motivates people to participate in them. Allameh, Zare and Davoodi (2011:1212) acknowledge that there is no consensus on knowledge management processes. Schiuma *et al* (2012: 8) note that various different knowledge management processes have been proposed and they are using different terminologies to denote similar knowledge processes.

Owing to different scholars' point of view, there are three to eight successive levels of knowledge management activities which also overlap each other. Ramachanran, Chong, and Ismail (2009:207) are of the view that researchers have proposed between three to eight knowledge management processes depending on their background and interests.



### **2.8.1 Knowledge creation process in the public sector**

Knowledge creation is the development of new knowledge in the organization so that it can be used by individuals or employees. Cong *et al* (2007:256) define knowledge creation as a process in which organizations can create new knowledge that can be absorbed by their employees and further applied to production activities or services. They consider knowledge creation as a cyclical process in which new knowledge is created by physical operations or interactions of continuous justification and modification among people.

Nonaka and Takeuchi (1995) describe knowledge creation as a dynamic and continuous process involving the acquisition, accumulation, creation and exploitation of new tacit and explicit knowledge. Organizations should create knowledge for competitive products and services. Hong, Jinwon, lee and Oneki (2016:1) state that knowledge creation helps firms to develop new products and services to respond quickly to market requirements. Fostering competitive advantage and optimizing organizational performance in the current complex and dynamic environment requires an organization's capability to create and transfer new knowledge practices (Alipour, Idris and Karimi 2011:61).

Public sector organizations generate a lot of knowledge. Certainly, the public sector is knowledge intensive because it generates a lot of tacit and explicit knowledge. This knowledge is created through meetings, brainstorming and conversations via tea and lunch breaks, emails, phone calls, conferences, workshops and informal meetings (Dewah and Mutula 2014:363; Shajera and Al-Bastaki 2014). According to Nair (2013:16), Enterprise Singapore, a government agency has developed programmes such as storytelling to capture employees' overseas experiential knowledge to help those who are going to be posted abroad. He further notes that to promote greater knowledge sharing, tea sessions called the 'Passport Series' provide staff with the opportunity to listen firsthand to the regional or center directors' experiences, and accelerate knowledge acquisition in an informal setting.

Yasin (2013:64) notes that Malaysian Agricultural Research and Development Institute (MARDI) is a public-sector funded, research and development institute. MARDI has various platforms created to encourage tapping into tacit knowledge. These platforms

include: brainstorming sessions for policy and planning; coaching and mentoring for human resource development; and innovative and creative circles for improvement in work process. Other platforms comprise of forums to exchange ideas and perspectives, public lectures to share research findings, structured interview to gauge knowledge in specific area, and assignment analysis to benchmark work process.

In the education sector, the significance of knowledge management is noted by Edge (2005:44) who cites its place in improving Toronto District School. This school is the fourth largest school district in North America and it is located in Toronto, Ontario, Canada. Toronto District School designed the Early Years Literacy Project (EYLP) to improve literacy overall instruction and student achievement. Edge (2005:47) observes that this was achieved through teacher and leader-learning enhanced by both tacit-to-tacit and tacit-to-explicit knowledge conversion strategies employed by EYLP. According to Edge (2005:47), one of the most significant elements of the success of EYLP is the recruitment, training and support of literacy coordinators. These coordinators engage teachers in tacit knowledge conversion using strategies such as: book and study groups; discussion and planning sessions; lesson and instructional technique modeling; mentoring; inter-classroom observation; and, team teaching.

Public university libraries in Tanzania exchange tacit knowledge through various such as staff meetings, conferences and seminars. Focusing on these libraries in Tanzania, Mosha (2017:270) established that the library staff shared experiences among themselves and library users. The library staff shared experiences and skills where senior staff guides junior staff on performing various library duties. In this case, the libraries prepare or set a permanent room where people can sit and socialize during brainstorming sessions.

Public sector institutions convert tacit knowledge to explicit knowledge. Nair (2013:16) notes that one of the biggest challenges in storytelling is acquiring the story itself. Therefore, an organization assists in codifying its staff stories by recording and transcribing their experiences. Yasin (2013:62) adds that MARDI's staff are encouraged to write in various publications such as: *Journal of Tropical Agriculture and Science* (JTAFS),

*Economic and Technology Management Review (ETMR), Corps Technology Bulletin, Food Technology Bulletin, Poultry Technology Bulletin*, technology manuals, books, and monographs.

Public university libraries in Tanzania carry out current awareness services, catalogue and classify their information resources. A study by Mosha (2017:240) established that public university libraries in Tanzania send alerts to inform library users on the arrival of new materials. These libraries also make announcements on library issues through brochures and posters created by library staff. Mosha (2017:240) notes that these methods were practised in the State University of Zanzibar and University of Dodoma libraries. Mosha (2017:240) also observed ongoing cataloguing and classification activities, and the existence of library policies at Muhimbili University of Health and Allied Sciences and University of Dar-es-Salaam libraries.

Public sector organizations facilitate knowledge creation by providing hubs for researchers to innovate. Ogiwara (2013:57) explains that the Agency for Science, Technology and Research (A\*STAR) is the lead agency in Singapore fostering world-class scientific research and talent for a vibrant knowledge-based and innovation-driven. The agency runs under Singapore's Ministry of Trade and Industry. The institution has created a knowledge ecosystem consisting of biochemistry, physical science, and engineering. It has greatly been supporting Singapore to become Asia's innovation capital. This case clearly shows that government institutions are potentially able to create hubs of innovation by focusing on knowledge ecosystem. Through such ecosystems new knowledge, innovative ways of looking at things, and new ways of doing things are sustainably created. This ultimately boosts innovation in the public sector. Successful public sector organizations are those that continually create new knowledge and then disseminate it widely throughout their systems (Shajera and Al-Bastaki 2014).

### **2.8.2 Knowledge storage process in the public sector**

Knowledge created in organizations should be stored in order to facilitate its future access and use. Martelo-Landroguez and Capeda-Carrion (2014:3) define knowledge storage as

the retention of stored information from an organization's history, its quick and easy access in order to be applied on present decisions. Pandey (2014:155) recommends that once knowledge has been created, acquired or collated, it should be stored in repositories so that individuals, groups and organizations can have access to it. Ling (2011:8) suggests that any piece of knowledge or information that has contributed to the performance of an organization could (and perhaps should) be stored in the corporate memory. This includes knowledge about products, production processes, customers, marketing strategies, financial results, strategic plans and goals.

According to Pandey (2014:155), the greater aim of knowledge storage is its use in the organization by personnel who require knowledge, want it at the right time and at the right place for decision-making. Dewah and Mutula (2014:363) add that codified knowledge can be stored in databases where it can be accessed and used easily by anyone in the organization. Bharadwaj, Chauhan, and Ramanadd (2015:428) recommend that explicit knowledge can be stored as best practices or lessons learned databases. They further note that the storage and use of tacit knowledge can be facilitated through corporate portals. Bharadwaj *et al* (2015:428) advise that combining or integrating decentralized knowledge reduces redundancy, enhances consistent representation, and improves efficiency by eliminating excess volume. Organizations should facilitate easy access to stored knowledge. It is important for organizations to store knowledge in a user friendly and easily accessible form (Bharadwaj *et al* 2015:427).

Public sector organizations seemingly have knowledge bases used to store best practices and lessons learned. Nair (2013:15) citing the case of Singapore's International Enterprise (IE) acknowledge that the firm has a knowledge base whose objectives are three-fold:

- To minimize knowledge loss when a staff transfers to another department or leaves the organization;
- To share captured knowledge with other employees;
- To shorten employees' learning curve.

Bunyagidj (2013:43) cites the case of Taphanhin Crown Prince Hospital (TCPH) a district health center in Bangkok. The hospital transforms individual knowledge particularly from its senior staff into organizational knowledge. The hospital shares and codifies tacit knowledge and collects it into a knowledge repository for easy access by employees. Biygautane and Al- Yahya (2010) notes that in the Dubai Police Aviation department, pilots are required to use certain manuals. These manuals carefully capture details about the most recent techniques in the aviation industry. Therefore, the manuals allow transfer of knowledge from the experienced to the less experienced police. This ensures that tacit knowledge is exchanged among all employees.

Public sector organizations seemingly capture knowledge from retirees through exit interviews for future reference. Janus (2016:96) notes that Uganda's Ministry of Agriculture, Animal Industries and Fisheries systematically documents its retirees' experiences using exit interviews. The interviews are captured on video. The exit interviews are also summarized in brief lesson notes and stored in the organizational online library for reference.

A study by Shabane (2017:140) established that in the South African Department of Defense knowledge was generated during meetings and documented in the form of minutes, reports, submissions and Cabinet memoranda. However, this knowledge was not stored because the department was not capturing and storing the experiences of employees in a database. This was because the department does not have a repository for storing its organizational knowledge.

Shabane (2017:168) advises that in order for the public service to be successful, it needs to start capturing, documenting and keeping the knowledge held by employees in a database, especially for those employees soon retiring. This will ensure that there is a stock of knowledge that can be re-used by newly appointed employees. Ramohlale (2014:185) recommends that the Department of Defense in South Africa should embark on efficient methods of knowledge storage so as to consolidate all knowledge experiences they undergo on their missions and lessons learnt.

### **2.8.3 Knowledge sharing process in public sector**

According to Kumar and Ganesh (2009:163), knowledge sharing is a process of exchange of explicit or tacit knowledge between two agents. In this exchange, one agent purposefully receives and uses knowledge provided by another. An agent can refer to an individual, a team, an organizational unit, the organization itself or a cluster of organizations. Llopis and Foss (2016) suggest that it requires the firm not only to share knowledge but also to integrate it into daily organizational processes at large.

Knowledge sharing is an important predictor of organizational success. Clercq (2015) notes that knowledge sharing:

- Speeds up response time;
- Increases efficiency by not reinventing the wheel which costs money and time;
- Increases innovative capability;
- Leads to better decision making;
- Preserves existing knowledge;
- Increases staff commitment;
- Helps develop a stronger organizational identity.

Public sector organizations perhaps share their knowledge to employees using various methods such as: Cop, mentoring, apprenticeship programmes, subject matter experts, on-job training, attending seminars, workshops, storytelling and conferences. O'Brien (2014) states that formal knowledge sharing mechanisms comprise of training sessions, plant tours, apprenticeships, employee transfers, and a variety of information technology tools that enable collaboration. Further, O'Brien (2014) observes that informal mechanisms such as coffee break conversations, unscheduled meetings, and informal seminars have also been promoted as a means of sharing knowledge.

Contributing on knowledge sharing in the public sector, Biygautane and Al- Yahya 2010 note that Dubai's Police organizes workshops and lectures that target specific skills and calls each policeman to share their experiences and ways in which they dealt with a specific

issue. They also share and transfer it by establishing cross-organizational and self-managing teams, and arranging weekly meetings among its employees. Bunyagidj (2013:43) of Taphanhin Crown Prince Hospital (TCPH) acknowledge that employees at the district hospital share lessons learned from errors and failures using identified appropriate sharing methods depending on the seriousness of the incidents. For example, distribution to all units, posting on the knowledge management website, or sharing in COP.

Shabane (2017:138) states that the South African public service departments use formal and informal methods to share knowledge. These methods range from mentoring and coaching, networking, memoranda submissions, meetings, electronic transfer, documentation, information sessions and workshops. Some of the methods used for knowledge sharing among employees in KIPPRA are: meetings, trainings, discussion groups, workgroups, round tables and mentorship (Mungai 2014:109). These findings point to the wide range of methods for knowledge sharing in public sector organizations.

The public sector seemingly coordinates knowledge sharing through knowledge assets such as research projects reports. For instance, Ogiwara (2013:57) notes that A\*STAR plays a supporting role for research projects in Singapore. The agency has created conducive environment for knowledge flows by attracting world-class researchers, providing cutting-edge physical research facilities, and playing a role of facilitator and coordinator. Yasin (2013:62) acknowledges that at MARDI, information, knowledge, scientific findings, and agricultural skills acquired from research and development activities are channeled to the public via publications, exhibitions, conferences, and seminars at national and international levels. Biygautane and Al- Yahya (2010) indicates that Dubai police are strongly encouraged to write about new cases encountered and how they solved them.

A study by Mosha (2017: 270) established that librarians in public universities in Tanzania present papers in various conferences, create essential dialogues and learn by observing. Therefore, it can be said that public sector organizations use both formal and informal methods of knowledge sharing among their staff. Public sector institutions use training as

a method of knowledge sharing. Biygautane and Al- Yahya (2010:7) confirms that in the Dubai Police Aviation Department, there are regular training workshops where pilots are introduced to new practices.

Public university libraries in Tanzania share knowledge with their users through training. Mosha (2017:270) established that there were library orientation and/or information literacy training programmes conducted by public university library staff in Tanzania. Such programmes enable library users to utilize information resources and also enable them to find, locate and use information/knowledge they need. Janus (2016:98) notes that the government of Kenya asked the Kenya School of Government (KSG) to become one of the several key partners for knowledge sharing and learning on devolution. This is because KSG has a strong record of developing structured learning for the public sector in Kenya as well as in neighboring countries.

## **2.9 Information and communication technologies used for knowledge management processes in the public sector**

This section highlights the role of ICTs in knowledge management processes. It further provides an overview of the types of ICTs used to facilitate knowledge management processes. The section concludes by explaining based on the study's third objective, how public sector organizations are using ICTs for knowledge management processes.

ICTs are used to improve the efficiency and effectiveness of organizations' business processes. Wiels *et al* (2015:5) are of the opinion that ICT facilitates firms to restructure their organizational structures, reengineer their business processes and develop completely new products. Palvalin, Lönnqvist and Vuolle (2013:11) add that ICT is a potential source of knowledge work productivity improvement. This is because ICT is used to eliminate non-value adding tasks or make them more efficient. This leaves time for the most important task (s). Organizations use ICTs as facilitators of knowledge flow. ICT allows the movement of information at increasing speed and efficiencies and thus facilitates sharing as well accelerated growth of knowledge (Semertzaki 2011; Bacerra-Fernandez and Sabherwal 2008). According to Semertzaki *et al* (2011), new technologies offer



unprecedented possibilities for human creativity, global communication and access to information.

There are various ICT tools that are used for knowledge capturing, creation, storage and sharing use and reuse. Semertzaki (2011) advises that a well-designed and operational knowledge management system should be in place to facilitate the implementation of the management of knowledge. Alavi and Leidner (1999:3) agree that the concept of coding and transmitting knowledge in an organization is not new. However, what is new is the potential of using modern information technologies such as internet, intranets, browsers, data warehouses, data filters and software agents. Such ICTs are used to systematize, facilitate and expedite firm wide knowledge management. Table 2.3 illustrates how various authors have classified ICTs for knowledge management. This study examined ICTs for knowledge management focusing on Web 2.0 technologies, collaborative content, intranet, and e-learning platforms.

**Table 2.3: ICTs for knowledge management**

<b>Authors</b>	<b>ICTs for knowledge management</b>
Alavi and Leidner (1999)	Internet, intranet, data warehouses, data filters, and software agents.
Jackson (1998)	Document management systems, information management systems, searching and indexing systems, experts systems, communication and collaboration systems, and intellectual assets systems.
Tyndale (2002)	Intranets, Web portals, content management systems, information retrieval engines, relational and object databases, electronic publishing systems, groupware, work flow systems, push technologies, help desk applications, customer relationship management, data warehousing, data mining, and business process engineering.
Liao (2003)	Knowledge-based systems, data mining, ICT, artificial intelligence or expert systems, database technology and modeling.
Fombad (2008)	Collaborative technologies, data warehouse, knowledge repository, best practices, document management, knowledge portals, intelligent tools, expert profiles, visualization software, content management systems, online question and answer, customer help desk, discussion forums, benchmarking, search and retrieval software, collaboration and project work spaces.
Uriarte (2008)	Document management systems, enterprise portal, knowledge maps and skills management, collaboration tools and COP.
The Asian productivity (2010)	Collaborative social work spaces, knowledge mapping, expert locator, blogs, Voice-Over-Internet Protocol (VOIP), knowledge portal, wikis, and video sharing.
Dalkir (2011)	Content creation, content management, communication and collaboration technologies, networking technologies, E-learning technologies and artificial technologies.
Nazim and Mukherjee (2016)	Databases, advanced Web tools (internet, intranet, mobile technologies, blogs ,wikis RSS and instant messaging), knowledge repository, knowledge portal, social media technologies (Facebook, video sharing, Twitter and blogs), social book marking, knowledge organization and discovery tools ( indexing, taxonomies, metadata, data warehousing, data mining, knowledge mapping and knowledge discovery).
Semertzaki (2011)	Web-based tools, expertise access tools, e-learning applications, synchronous interaction tools, discussion technologies and internet systems.
Young and Milton (2011)	Telephones, community software (social networks e.g. Facebook, LinkedIn, Twitter. Blogs, Yellow pages and teleconference video), collaborative software (e.g. wiki), knowledge libraries (shared folders and a file structure, portal and wiki), search tools, RSS feeds, and tagging.

### **2.9.1 Web 2.0 technologies used for knowledge management processes**

Web 2.0 technologies facilitate knowledge management processes. Bengler and Slyke (2011) refer to Web 2.0 as a second generation of applications on the internet where the user becomes a participant in the interaction. Krogh (2012) adds that Web 2.0 or social software or Enterprise 2.0 is software that supports group interactions towards establishing communities, and creating and exchanging content. This study used the term Web 2.0 for consistency purposes.

Bengler and Slyke (2011) state that the set of technologies referred to as Web 2.0 include: wikis, social networking, blogs, mashups, Twitter, Web conferencing, collaborative content, RSS feeds and instant messaging. This study reviewed literature on wikis, social networks, blogs, Twitter, mashup, Web conferencing, RSS feeds, instant messaging, collaborative content, intranet, and e-learning platforms.

Krogh (2012) argue that Web 2.0 has three layers of relevance to knowledge management. First, such technology is founded on socially-originated principles, including peer production and unbounded collaboration. Second, it consists of a series of applications such as blogs, wikis, social book marking, data mashup, editing platforms and media sharing. All these applications are intuitive to understand and easy to use. Lastly, Web 2.0 technology is based on infrastructures such as open platforms and enabling services that reap considerable economies of scale.

#### **2.9.1.1 Wikis**

A wiki is a webpage used by organizations for collaborative authoring and knowledge sharing. A wiki is a webpage that allows staff to jointly edit, including adding and deleting content on a chosen topic (Belanger and Slyke 2011; Milton and Young 2011). According to Bolisani and Scarso (2016), a wiki makes immediate and joint authorship easy. Further, in a wiki it is possible to track changes made by others by means of a “versioning” system. All these functionalities, offer opportunities for collaborative knowledge creation. In addition, Krogh (2011) state that wikis in organizations enable many people to collaborate

easily in the creation of specific content. This is an integral function that allows new and possibly better content to emerge.

Almeida and Rocha (2011) argue that one way to share knowledge is through personal communication. They assert that if wikis have the underlying ability to connect people, then they would also have the aptitude to assist the transfer of both explicit and tacit knowledge. APQC (2011) established that wikis are used to manage projects, write white papers and capture lessons learned along with virtually any other collaborative purpose. Wikis are easy to use and less expensive. Anngia and Sensuse (2013:2) observe that wikis can be used for knowledge creating sharing, collaborative authoring, and online discussion.

#### **2.9.1.2 Social networking**

Social networking facilitates internalization mode of SECI model by providing tools such as Facebook, LinkedIn, Twitter, and email chats. Wagner *et al* (2014) explain that an individual can post content in the form of text, audio and/or video to a social network site. Thereafter, other community members may then comment, like or otherwise rate the post content on. This helps the person who originally posted the content to internalize the results while developing the idea further. Young and Milton (2011) add that social networking such as Facebook and LinkedIn have discussion capability for interaction between community members. Wagner *et al* (2014) explain how a novice in an organization is socialized through social networking by identifying and connecting to a senior expert in his or her field. Through a social network site or a microblogging service the novice can follow the senior expert's updates. Wagner *et al* (2014) further note that the update allows the novice to observe the behaviour of the expert. This gives him or her potentially valuable information about important meetings or conferences with other senior experts.

#### **2.9.1.3 Blogs**

Blogs are used for knowledge creation, storage and sharing. A blog is a type of webpage usually maintained by an individual and containing regular entries of commentaries, descriptions of events or other materials such as videos (Tripathi and Kumar 2013). A blog

is an online software application for authoring short articles that show entries in order of greatest currency. A blog is useful for recording knowledge and insights from projects and activities as they happen (Lambe and Milton 2016).

Blog authoring generates content and puts it online for a broad audience (McAfee 2009:133). According Wagner *et al* (2014), authoring may take a variety of forms and the content needs can be written in words, include links, audios and video. Faraj, Jarvenpaa and Majchrz (2011) acknowledge that authoring allows people to freely articulate their thoughts and make the articulations available for wider public to view and discuss.

Blogs allow individuals to write commentaries or opinions on anything they want on websites that others can read. Blogs are updated regularly and allow others to leave comments (Belanger and Slyke 2011). Blogs also encourage user interaction through their comment feature which allows users to provide feedback on a given article (Nazim and Mukherjee 2016). According to Anngia and Sensuse (2013:2), blogs are used in knowledge conversion in the SECI model which recognizes externalization as a process where tacit knowledge is converted into explicit form. Blogs are increasingly being used as a mechanism to disseminate information to COP. They can also be used to showcase new materials, inform people of changes of marketing best practice and to announce internal events and conferences (Young and Milton 2011).

#### **2.9.1.4 Twitter**

Twitter is an online tool used for communication and knowledge storage. Khasawneh and Abu-Shanab (2013:11) say that Twitter can be described as a large repository of information and as another form of electronic word-of-mouth (e-WOM). Twitter can be used for socio-political and marketing purposes. It can also be used to support an external community of interest (Young and Milton 2011).

### **2.9.1.5 Mashup**

Mashup allows users or developers to combine data or applications from several sources to create new ways to view data or new aggregated results. Zhu and Meza (2012) states that mashup use the Web itself as the programming and content delivery platform. They further states that mashup access data or information directly from websites and programmatically create dynamic new websites or Web applications. This enables mashup to present data in a more integrated or useful way. Hanson (2009) argue that mashup create an extremely agile and dynamic design and implementation environment within an enterprise realm allowing users with limited technical skills to develop powerful and useful applications and services. In combination mode of SECI model, mashup facilitates integration of explicit knowledge to explicit knowledge. Bitzer, Ramroth, and schumann (2009) states that through bonding of several Web services, previously separate applications and contents can be combined and lead to a new benefit for the user. Zhu and Meza (2010) add that mashup will help reuse and leverage of existing knowledge to create new sources of knowledge and stimulate innovation.

Zhu and Meza (2010) provide examples illustrating how mashup technology is used to integrate explicit to explicit knowledge. First, mashup combines a knowledge system (such as publications, reports, and documents) with an expert system to create a personalized knowledge system or an expert-based knowledge system. Second, mashup overlays publications, reports, and documents with organizational structure or project teams to create an organization portfolio or project portfolio. Third, mashup blends sales data with sales staff information to provide further analysis of the sales force. Fourth, mashup mixes sales data with geographic information and product information to provide a view of the market per product and per region. This helps the company to form and improve its marketing strategy. Lastly, mashup combines supply requests with business units and product lines to provide further analysis of produce process and production efficiency.

#### **2.9.1.6 Web conferencing**

Web conferencing supports interaction of people working together and consequently generation and sharing of knowledge. Belanger and Slyke (2011) say that Web conferencing allows individuals to conduct live meetings via the internet including training sessions or sales presentations. Hence, all participants use their computers to connect to the meeting and can employ voice as well as send files, use instant messaging or even share personal desktops with others. Gordillo, Yankina, and Du (2009) acknowledge that Web conferencing allows the creation of new and transfer of existing knowledge by sharing documents, applications, and peoples' experience and expertise.

Gorghiua, Gorghiub, Bîzoi and Suduc (2010:2814) provide benefits of video conferencing. First, virtual meetings eliminate physical limitations of distance and associated expenses. Second, video conferences allow direct interaction with the presenters and disseminate the outcomes through a Web conference. Lastly, video conferencing facilitates storage of knowledge for later use.

#### **2.9.1.7 Really Simple Syndication feeds**

RSS technology pushes relevant information to employees and customers via subscription. Nazim and Mukherjee (2016) states that RSS feeds are designed to feed subscribers with regularly changing Web content of news like site, news-oriented community sites, and even personal blogs without requiring users to visit multiple sites to receive updates. A RSS tool is used for knowledge sharing. New lessons and new process improvements can be automatically forwarded to the RSS feeder as soon as they are published, without the need to browse the website (Young and Milton 2011).

#### **2.9.1.8 Instant messaging**

Instant messaging is a communication tool that is used for sharing knowledge in organizations. Belanger and Slyke (2011) show that instant messaging allows several individuals to communicate via real-time text based messages. They further add that presence awareness indicates when colleagues are currently online and connected. Nazim

and Mukherjee (2016) observe that instant messaging may be used for online chatting so that individuals may ask questions and receive responses directly. Moreover, through instant messaging, organizations can reach remote users around the world.

#### **2.9.1.9 Collaborative content**

Collaborative content allows several individuals to contribute to and share stored data and documents such as text documents, movies, pictures, and calendars. Wahlroos (2010:11) notes that YouTube and Slide share are examples of collaborative content. Belanger and Slyke (2011) add that collaborative content systems control user access, and versioning, avoiding two users from changing a document simultaneously.

#### **2.9.10 Intranet**

Organizations are using intranets for storing internal knowledge and sharing knowledge amongst employees. Boerma and Kingma (2011) define intranet as an ICT based upon the Internet ([http:// www](http://www), TCP/IP) technology. In this technology, WWW and TCP/IP stands for World Wide Web and Transfer Control Protocol/Internet Protocol respectively. Corporate intranets became more popular as organizations started to realize that they could provide a simple route via a Web browser to a library of company's information and explicit knowledge (Young and Milton 2011). Intranets provide access to a company's databases and they enable the distribution of documents (Wahlroos 2010:11).

Nazim and Mukherjee (2016) note that intranet is a private computer network. Boerma and Kingma (2011) add that access to intranets is restricted exclusively to organizational members by means of electronic firewalls. Intranets facilitate storage, communication and information sharing among organization members only if the employees can find the data they need, judge the information to be valid and current, and trust the gatekeepers, who are responsible for the content of the Intranet (Boerma and Kingma 2011).

Quin (2013) notes that searchable databases connected via intranets make it easy to find historical or archived data. Intranets accommodate some Web 2.0 technologies such as wikis, blogs and video conferencing. Wahlroos (2010:11) acknowledges that many



organizations have started to integrate social media applications into their intranets. For instance, different collaboration tools such as discussion forums, wikis, common calendars and computer-based videoconferencing.

#### **2.9.1.11 E-learning technologies**

E-learning is computer-based and it supports learning in organizations. Khademi *et al* (2011) assert that e-learning or computer-supported learning focuses on an individual's acquisition (or rather construction) of new knowledge and the technological means to support this construction process. Ho (2010) adds that e-learning provides a good environment for people in organizations to learn. E-learning facilitates knowledge creation, storage and transfer. E-learning permits participants to acquire knowledge, pass it from one person to another, apply it to organizational problems/opportunities, and store that knowledge for future use.

Public sector organizations are probably using ICTs to create, store and provide information internally among themselves, citizens and other stakeholders. Goh, Chua, Luyt, and Lee (2008:349) note that many governments have launched knowledge management projects to meet the needs of the public. In conjunction with such efforts are e - government initiatives that promote more efficient processes by facilitating improved access via information technology to information and services. E-government services also foster better relationships between the government and citizens, businesses and other organizations.

Khasawneh and Abu-Shanab (2013:1) indicate that the development of social media (e.g. blogs, websites and other social networking tools) makes the public sector around the world join these sites in order to benefit from a new way of communication. Further, the authors recognize that social media has become a platform that is easily accessible to anyone with Internet access. This makes governments that have joined social media websites have the capacity to rebuild the relationship with their citizens and increase the level of citizens' engagement and participation.

### **2.9.2 Information and communication technologies used for knowledge creation process in the public sector**

There are various ICT tools that used for the knowledge creation process in the public sector, for example, e-learning tools, data mining and enterprise portals. Lamont (2011) posit that military services have recognized the value of knowledge management and have committed significant resources to initiatives that range from online knowledge portals to dashboards. Lamont (2011) adds that methods for knowledge exchange include the use of social media, internet, video and collaborative forums that are open to war fighters who have access to the army's networks.

Public university librarians in Tanzania use ICTs such as Facebook, telephones, Skype, wikis and blog to create knowledge. Mosha's (2017:201) study results established that majority of public university librarians in Tanzania share methods, understanding, experiences and skills through the use of Skype and wikis. They communicate through phones and Google Talk. They also participate in group discussions through Facebook and blogs.

### **2.9.3 Information and communication technologies used for knowledge storage process in the public sector**

Public sector organizations seemingly have developed electronic repositories for storing explicit knowledge. McNabb (2006:51) lists ICT tools used for knowledge storage as: knowledge repositories, electronic bulletin boards and databases. Yasin (2013:62) explains that there are various systems used for knowledge storage and retrieval by MARDI employees and the public. Notable among these systems are: MyFruits, MePIS, AgrobIS, Plant Genetic Resource for Food and Agriculture (PGRFA) and SMART.

According to Yasin (2013), MyFruits is a 'one-stop-shop' for information about tropical fruits. MyFruits offers over 1,000 information sheets on all aspects of tropical fruit production, processing, and marketing. MePIS provides information on tropical herbs research and development, e-gallery, and books. AgrobIS is an information system developed by MARDI to provide the public direct access to data on all biological genetic

resources conserved in the organization. The system contains germplasm information of more than 40,000 accessions of PGRFA covering fruits, rice, vegetables, and medicinal plants. The system also consists of information on 2,500 isolates of microbial-genetic resources and about 30,000 specimens of arthropods. SMART provides information on more than 300 technologies developed by MARDI and which are commercialized or in the up-scaling status.

Kim (2013:34) notes that the Korea custom service uses a knowledge management portal system to integrate and share all of the internally and externally amassed information. Kim further states that the aim of the knowledge management portal system is to enhance workplace productivity through the systematic accumulation and sharing of work knowledge and know-how. The system seeks to establish a widespread culture of knowledge management to employees.

Another application of ICTs in knowledge storage is shared by Biygautane and Al- Yahya (2010). The authors note that when a Dubai court judge finalizes a case and announces the verdict, he is required to electronically store the case details. Further, the judge is expected to how he reached a certain decision. The stored judgment knowledge is used for future references by other judges with a similar case.

#### **2.9.4 Information and communication technologies used for knowledge sharing in the public sector**

There are several ICT tools used for knowledge dissemination in the public sector, such as intranet, wikis and social media. Various examples in the public sector illustrate the place of intranets. Nair (2013:15) observes that to encourage expertise building and knowledge sharing, IE in Singapore has developed an in-house intranet, Integrated Employee Exchange (IEX) with a dedicated portal (knowledge Center) to capture market and industry intelligence. MARDI has set up AnjungNet, which is an intranet for its staff in order to facilitate internal communication through e-forums and e-news (Yasin 2013:63).

The government of India, under the Ministry of Defense has implemented Bharat Electronics limited (BEL). This is a knowledge portal which hosts an expert locator system, discussion forums and communities pertaining to project knowledge. The portal is linked to quality manuals, business excellence, suggestion schemes, human resource and has blogs implemented to improve communications, collaboration, learning, and managing knowledge (Young 2013:27).

According to Kim (2013:33), the Korea custom service uses a one-stop customs service known as 'Single-Window Customs System'. This system allows handling customs' procedures in a single clearing. In the system, data can automatically be sent to agencies that require inspections or quarantine information such as the Korea Food and Drug Administration and other agencies.

The public sector also uses e-learning for knowledge sharing. Bunyagidj (2013:43) confirm that public hospitals are using e-learning on knowledge management courses to support those working in the afternoon or night shifts. Upon completion of the training, there is follow-up and assistance on how to use the e-learning tools whenever the need arises. The Department of Defense in South Africa shares knowledge using Lotus Notes and emails. Ramohlale (2014:177) established that the department has technological means capable of sharing knowledge. The author further notes that most of the staff members use Lotus Notes to share information although not knowledge per se with majority of staff showing faith in the mailing system and the intranet.

A study by Mosha (2017:252) established that majority of public university librarians reported using Web 2.0 tools such as Skype, wikis and blogs. Through these technologies, library staff share their experiences and understanding about various activities conducted in the library. Mosha adds that university librarians in Tanzanian also share and communicated knowledge by using Google Talk and Skype.

In Kenya, Mungai (2014:111) found out that even though KIPPRA had heavily invested in technology, there were no specific ICT platforms that had been exclusively designated for

tacit knowledge sharing. The researcher further established that KIPPRA's employees shared their tacit knowledge using external ICT platforms such as blogs, social media, intranet and professional online discussion forums.

## **2.10 Challenges experienced by the public sector in the adoption of information and communication technologies to facilitate knowledge management processes**

This section discusses the challenges of integrating ICTs for knowledge management processes in the public sector. The discussion informs the last objective of this study. Weerakkady and Irani (2016) acknowledge that there are real challenges and risks associated with Web 2.0 in terms of public administration. This section focused on challenges of ICT adoption for knowledge management relating to: integrity of information; privacy and security of content, and inclusiveness.

### **2.10.1 Integrity of information**

Web 2.0 content on such platforms such as wikis, blogs, Facebook, and Twitter is not peer reviewed. This raises the concern on its completeness, accuracy and quality. The government of Hong Kong Special Administrative Region (2008:6) notes that wikis are vulnerable to misinformation and anonymous authors could make malicious or unauthorized changes to information being published. Weerakkady and Irani (2016) argue that there is a risk of information overload and poor quality of content shared by public users when using some Web 2.0 applications such as blogs and wikis. Mergel (2011) adds that public managers face the challenge of responding to concerns about information overload and the potential loss of control over information contributions.

### **2.10.2 Privacy and security of content**

In public sector organizations, information may be leaked using the Web 2.0 technologies. Mergel (2011:29) observes that public managers who want to adopt a wiki approach in government have a privacy concern on leaks or accidental exposure of proprietary information. The Government of the Hong Kong Special Administrative Region (2008:5) notes that sensitive corporate and customer information may be leaked when a staff

member writes and shares information or opinion through a blog. This is because it is difficult for the organization to control what information has been published and officially released. Weerakkady and Irani (2016) note that the open nature of Web 2.0 presents significant challenges to the traditional enterprise approach to controlling intellectual property over information shared and surety of these applications.

According to Weerakkady and Irani (2016), the increase in functionality and interactivity has increased the ways in which a Web 2.0 application can be attacked successfully by hackers and viruses. This proves to be a security concern for organizations. RSS feeds provide an avenue for malicious attacks to organizational knowledge. The Government of the Hong Kong Special Administrative Region (2008:6) notes that there is no standard mechanism to authenticate the publishers of feed entries. Therefore, malicious attackers can make use of these Web feeds to inject literal JavaScript into the RSS feeds to generate attacks on the client browser.

### **2.10.3 Challenge of inclusiveness**

Use of ICTs pose a challenge of inclusiveness especially to those who are technology illiterate and if the technologies present information in a language not understood by the reader. Mergel (2011) notes that citizens can very easily be excluded because of digital literacy issues. Digital illiterate citizens find no alternative to the information collaboratively collected, commented on and reengineered on a wiki. Further, she adds that interactivity with other citizens who are solely contributing and collaborating on the wiki is lost for those potential contributors who aren't able to access the wiki.

De Kool and van Wamelen (2008) note that Web 2.0 applications are mostly used by well-educated young and adult generation in the developed part of the world. This can lead to wider societal divides by giving more voice to those that already have it or use it. Blank and Reisdorf (2012) add that there is also the risk of older people not likely to participate in Web 2.0 because of the lack of confidence in it or because of lack of technical ability. Mergel (2011) notes another challenge of using ICT tools in public sector organizations

concerns multilingual inclusiveness especially in areas with multiple language recommending translations.

## **2.11 Related studies on information and communication technology for knowledge management processes in public sector**

Review of related literature includes research findings, published and unpublished theories and principles formulated by experts or authorities in some fields or disciplines. It also entails ideas or opinions of experts contained in books, pamphlets, magazines and periodicals (Nava 2014). This study reviewed related studies compiled internationally and regionally Africa.

### **2.11.1 International studies**

There seems to be no international studies that have focused specifically on ICTs for knowledge management processes in the public sector. The few existing studies focus on the general subject of knowledge management in the public sector. Such studies have incorporated a section on ICT as a knowledge management enabler or as an element/factor of knowledge management success. Asian Productivity Organization (APO) (2013) studied on knowledge management for the public sector and concentrated on how six public sector organizations manage their knowledge. APO (2013) has however highlighted how some of these government agencies utilize ICT for knowledge management.

Young (2013) demonstrated how BEL in India use ICTs such knowledge portal to improve communication, collaboration, learning, and managing knowledge. The researcher further states that through implementation of a knowledge portal, BEL has created and implemented an expert locator system, active discussion forums and communities pertaining to project knowledge. BEL's knowledge portal is linked to quality manuals, Systems Applications and Products (SAP), business excellence, suggestion schemes, and human resource. Further, the knowledge portal is linked to an antenna which is a separate unit, joined and links staff's knowledge work within the portal. Young (2013) also notes that new learning are collectively and systematically captured in the knowledge portal.

The study by Kim (2013) acknowledges that the Korea Custom Services is internationally recognized as a result of using leading edge information technology for document digitization and networking, and the construction of an internet based import-export customs environment. This has led to the reduction of trade costs and the sophistication of the traveler customs systems, customer-focused management. Consequently, the agency is top ranked in several customs service areas.

A study by Biygautane and Al-Yahya (2010) on knowledge management in Dubai's public sector recognizes the importance of information technology in codifying and digitizing acquired knowledge. Edge (2005) conducted a study on public sector knowledge management based on EYLP, a programme designed to improve literacy overall instruction and student achievement in a Toronto District School. This school is the fourth largest school district in North America located in Toronto, Ontario, Canada. Data was collected using document analysis and semi-structured interviews.

From a knowledge management viewpoint, Edge (2005:50) established that one of the most significant challenges facing EYLP was the chronic lack of sophisticated technology in schools. She further noted that in many ways this may be the reason for the lack of technologically-orientated knowledge management strategies within Toronto District School Board and other education systems.

#### **2.11.2 Regional studies-Africa**

In this research, local studies focus on those related to ICTs for knowledge management processes within the African continent. Mosha (2017) investigated the application of Web 2.0 tools to enhance knowledge management practices in eight out of 12 academic libraries located in public universities in Tanzania. The study established that most of the academic libraries visited had websites. Further, majority of respondents acknowledged that they had personal accounts of the various Web 2.0 tools. The study also determined that most library staff had some level of experience with a variety of Web 2.0 tools. It was further recognized that despite the high level of familiarity and use of Web 2.0 tools, respondents were not frequent users of their library websites.



The study findings elaborated by Mosha (2017) established a low level of access and use of Web 2.0 tools within academic libraries in Tanzania. Therefore, it was recommended that academic libraries in Tanzania should promote and integrate knowledge management practices in their daily operations. In addition, it was suggested that academic libraries use knowledge management enablers such as, Web 2.0 tools, reliable power supply, internet connectivity availability and adequate ICT infrastructure.

Ramohlale's (2014) study on knowledge management practices at the Department of Defense in South Africa established that the organization does not maximally utilize ICT for knowledge management processes. Ramohlale (2014:177) acknowledges that the Department of Defense has a good information technology solution to address its knowledge management processes if given opportunity. However, information technology support was not used to enhance knowledge management processes.

Feltman (2012) carried out an investigation on the prevalence of knowledge management practices from 42 participants across five post grades within South Africa's Department of Agriculture, Forestry and Fisheries (DAFF) in Pretoria. The study established that information technology infrastructure, the use and coordination of knowledge management processes were found to partially meet the requirements as knowledge management enablers. The research further revealed that the integration of information systems across the entire organization had become one of the most important management challenges. Lastly, the study found out that many organizations were confounded by the complexities and subtleties involved in leveraging information technology resources. Hence, these institutions struggled to extract the true value from information technology and ended up basking in their sophisticated technological applications just to prove that they are part of the knowledge economy.

Onderi -Okemwa and Smith (2009) carried out a literature survey on the role of knowledge management in enhancing government service-delivery in Kenya. The researchers acknowledge that ICTs are important enablers that ensure that knowledge management programmes run effectively. However, it was established that Kenya lacks an adequate ICT

infrastructure to enable it to effectively implement e-governance and knowledge management programmes in the public sector.

Mungai's (2014) study on tacit knowledge management focusing on KIPPRA found out that 84 percent of the participants were not aware of any ICT platforms that had been implemented by the organization specifically to support tacit knowledge sharing. Mungai (2014:94) further determined that KIPPRA had rudimentary ICT platforms that could be used to enhance tacit knowledge sharing. Mungai (2014:111) recommended that KIPPRA should be able to acquire and customize ICT platforms that provide interactive, collaborative and real-time technologies to enhance its employees' tacit knowledge sharing. The researcher also proposed that KIPPRA could also actively adapt the usage of collaborative social Web-based technologies such as social networking sites, wikis, blogs, podcast and instant messaging. These social Web technologies have over time, proven to build an environment where tacit knowledge has been shared freely by employees.

In a nutshell, it is noted that international and local findings show that public sector organizations are aware that ICTs can be integrated for knowledge management. The studies reviewed have shown that there are some public sector organizations with information technology infrastructure. However, there are not exploited to the fullest for knowledge management. The following section provides an overview of key findings from the literature reviewed on this topic.

### **2.11.3 Synthesis of literature review**

Findings of the literature review revealed that little research has been carried out on ICTs for knowledge management processes in the public sector. There exists few works generally on knowledge management in the public sector that discuss ICTs briefly as a knowledge management element or enabler (for example, APO 2013; Gichuhi 2014; Mungai 2014). Some public sector organizations are not aware of knowledge management and they have not also institutionalized it (Shabane 2017; Romohlale 2014; Mungai 2014). Public sector organizations unknowingly manage their knowledge using the processes of knowledge creation, storage and sharing. (Shabane 2017; Ramohlale 2014; Mungai 2014; Ohioorenaye and Eboreime 2014).

Literature reviewed indicated that public sector institutions recognize the role played by ICTs for knowledge management and confirmed the presence of these technologies in their organizations. However, these technologies are not fully exploited or integrated with knowledge management processes (Mungai 2014; Ramohlale 2014; Mosha 2017; Shabane 2017). Public sector organizations are using ICTs for knowledge sharing more than knowledge creation and storage (Mosha 2017; Shabane 2017). Most of the public sector organizations have identified ICTs as a challenge hindering implementation of knowledge management (Mosha 2017; Onderi - Okemwa and Smith 2009; Mungai 2014 and Ramohlale 2014). This study discussed how information and communication technologies are used for knowledge management processes in public sector. This research further attempted to bridge gaps identified in the previous literature reviews.

## **2.12 Summary of the chapter**

This chapter has discussed ICTs for knowledge management processes in the public sector. A literature map was provided to show how theoretical framework, objectives of the study and related studies are linked together. Literature related to ICT in the public sector was reviewed and presented. It would seem that there is an interest in the topic. However, we have few published articles and theses from various countries. Some of the notable works reviewed in this chapter are from scholars such as: Alavi and Leidner 1999 ; Bacerra-Fernandez and Sabherwal 2008; Onderi - Okemwa and Smith 2009; Semertzaki 2011; Wiels *et al* 2011; Yasin 2012; APO 2013; Palvalin *et al* 2013; Young 2013; Gichuhi 2014; Mungai 2014, Ramohlale 2014, Mosha 2017 and Shabane 2017.

The review of related worldwide and local studies established that public sector organizations are aware of the role played by ICTs for knowledge management processes. They however, have not fully embraced these technologies. Related studies also highlighted ICT as one of the challenges impeding the implementation of knowledge management in public sector organizations. Therefore, these findings certainly support the justification and significance of this study. This is because there is still more that ICTs can be used for knowledge management in public sector organizations.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.0 Introduction**

The research background, problem statement, objectives of the study and research questions are presented in Chapter One. The main objective of this study as outlined in Chapter One, section 1.3 was to investigate ICTs for knowledge management processes at the State Department of Infrastructure. The significance of literature review and theoretical framework and their relevance to the study are discussed in Chapter Two. The scope of the literature review was guided by the study's objectives.

The objectives this study focused on: knowledge management awareness, knowledge management processes, ICTs for knowledge management in the public sector, and challenges experienced by the public sector in the adoption of ICTs to facilitate knowledge management processes. Chapter two concluded by reviewing literature on related works on ICTs for knowledge management processes in public sector. In a nutshell, the first two chapters of this study provided the necessary background that informed the research methodology adopted by the researcher.

According to Babbie and Mouton (2001:647), research methodology denotes the methods, techniques, and procedures employed in the process of implementing the research design or research plans as well as underlying principles and assumptions that underlie their use. Research methodology is a detailed description of the research approach, research design, the target population, sampling procedures and methods, data collection methods and procedures, research instruments, ethical considerations, data analysis and presentation for answering research questions. These aspects of research methodology are articulated in this chapter.

#### **3.1 Research approaches**

There are three main research approaches, namely: qualitative approach, quantitative approach and mixed methods approach (Creswell 2009). According to King, Keohane, and Verba (1994:3), the styles of quantitative and qualitative research are very different. King

*et al* (1994:3) also note that the differences in these approaches are mainly ones of style and specific technique. The quantitative research approach helps in generating statistical data which in turn can be quantified. King *et al* (1994:3) opines that quantitative approach uses numbers and statistical methods. This research approach tends to be based on numerical measurements of specific aspects phenomena. It abstracts from particular instances to seek general descriptions or to test a causal hypothesis. Further, quantitative approach seeks measurements and analyses that are easily replicable.

The qualitative research approach is researcher-dependent on examining documents, observing behaviour and interviewing participants. Denzin and Lincoln (2014:4) note that qualitative researchers deploy a wide range of interconnected interpretive practices, hoping always to get a better understanding of subject matter at hand. A qualitative approach is flexible and capable of adjusting to new information during the course of data collection (Polit and Beck 2012:487).

According to Creswell (2014), mixed methods research is an approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data and using distinct approaches that may involve philosophical assumptions and theoretical frameworks. He further states that the core assumption of this form of inquiry is that the combination of qualitative and quantitative approaches provides a complete understanding of a research problem than either approach alone.

The current study adopted a qualitative research approach. This approach allowed the researcher to gain in-depth understanding of the problem under study in a natural setting. Qualitative research is a situated activity that locates the observer in a natural setting; it involves an interpretive, naturalistic approach to the world (Denzin and Lincoln 2014:3). Qualitative research provides a thick description that captures the sense of actions as they occur, placing events in context that are understandable to the actors themselves (Babbie 2001:272).

### **3.2 Research design**

Kombo and Tromp (2006:71) define a research design as an arrangement of conditions for the collection and analysis of data in a manner that aims to combine relevance with the research purpose. According to Creswell and Clark (2007), a research design is a procedure for collecting, analyzing, interpreting and reporting data in research studies. Research design is the road map for any study. It is a detailed strategy of how the study will be conducted. Yin (2014:29) states that the main purpose of a research design is to help avoid the situation in which evidence does not address the initial research questions.

The research design used for the current research was the case study. Yin (2014:237) defines case study as a research design that investigates a contemporary phenomenon in depth and in its real world context. Yin (2014:31) states that a case can be some events or entity other than a single individual. The State Department of Infrastructure in the Ministry of Transport, Infrastructure, Housing, and Urban Development in the government of Kenya is the case study for the current research.

The case study is deemed suitable for the current research as it helped the researcher gather in-depth information on the use of ICTs for knowledge management processes. This view is reinforced by Kothari and Garg (2014:109) who observe that the case study is a method of study in depth rather than breadth. This view is also noted by Punch (2005:144) who states that in qualitative research, a case study aims to understand the case in depth, and in its natural setting, identifying its complexity and context. While on the other hand, Kombo and Tromp (2006:72) notes that a case study seeks to describe a unit in detail, context, and holistically.

Many researchers in social sciences have raised the issue of generalization of the findings from case studies. Despite this concern, the current study does not intend to generalize its findings. Polit and Beck (2012:504) note that the biggest concern about case studies is generalizability. Thus, if researchers discover important relationships, it is difficult to know whether the same relationship would occur with others. Yin (2014:21) adds that case

studies, like experiments, are generalizable to theoretical propositions and not to populations or universes.

### **3.3 Population of the study**

Babbie (2010) defines the study population as the aggregation of elements from which the sample is actually selected. The study population included staff from the State Department of Infrastructure. The State Department of Infrastructure comprises of five divisions, namely: Mechanical and Transport services, Kenya Institute of Highways and Building Technology, Materials Testing and Research, Roads and Support Services division with a total staff of 2,162 employees. There are 55 heads of sections at the State Department of Infrastructure.

### **3.4 Sampling procedures and methods**

A sample is a smaller group obtained from accessible population. Sampling is the process of selecting a number of individuals in a study in a way that the individuals selected represent the larger group from which they were selected (Mugenda 1999). The researcher used a sampling frame provided by the Director of human resource management and development at the State Department of Infrastructure. A sampling frame is a comprehensive list of all the units or elements in the population.

There are two types of sampling procedures, namely: probability and non-probability sampling. Therefore, in research, there are probability (random) and non-probability (non-random) samples (Orodho 2008). In probability sampling, each sample has equal opportunity of being selected. Non-probability sampling is when the researcher does not select samples from the study population but rather picks the objects or elements that are convenient to his study. Pole and Lampard (2002:3) opine that non-probability sampling is often used where the aim is not to generalize from a sample to population and representativeness is thus of limited importance.

The current study used non-probability sampling. Non-probability sampling techniques include: purposive sampling, snowball sampling and convenient or accidental sampling.

The study used purposive sampling technique. Bryman (2008:358) notes that in purposive sampling, the researcher samples on the basis of wanting to interview people who are relevant to the research questions and he/she does not seek to sample research participants on a random basis. Pole and Lampard (2002:3) add that in purposive sampling, researchers make theoretically informed decisions as to whom to include in their studies. On the other hand, Bryman (2008:415) states that the goal of purposive sampling is to sample research participants in a strategic way so that those sampled are relevant to the posed research questions.

This study had a sample population consisting of 21 heads of sections from the State Department of Infrastructure. Table 3.1 presents a summary of the sampled study participants.

**Table 3.1: Sample population of the study**

<b>Participants' job titles</b>	<b>Number of participants</b>
Academic registrar, Kenya Institute of Highways and Building Technology	1
Senior Principal superintendent Engineer- materials	1
Senior Principal Physicist	1
Senior Chemist	1
Technologist- Soil	1
Geologist	1
Surveyor	1
Senior Principal superintendent Engineer	1
Engineers- operations	1
Systems administrators	1
Civil engineer – Roads	1
Senior Deputy secretary- administration	1
Head of accounts	1
Chief accountant	1
Head of information communication technology	1
ICT Officer	1
Head of quality assurance	1
Procurement officer 1	1
Supply chain management assistant	1
Director human resource and development	1
Deputy director human resource development	1
Economist	1
<b>N</b>	<b>21</b>



### **3.5 Data collection methods and procedure**

Data collection is an important aspect of any type of research and the methods for data collection vary depending on the design the researcher chooses. Punch (2005:168) notes qualitative research uses interviews, observation, and document analysis as data collection methods. The current study used interviews for data collection. Interviewing is one of the data collection methods in qualitative research (Yin 2014; Creswell 2009; Kombo and Tromp 2006; Punch 2005).

There are three types of interviews: personal or face-to-face interview, telephone and focus group interviews (Bhattacharjee 2012:78). This study collected qualitative data using personal interviews. In personal interviews, the interviewer works directly with the participants to ask questions and record their responses (Bhattacharjee 2012:78). Welman and Kruger (2001:158) state that when collecting data by means of personal interviews, interviewers visit the respondents at home or at their workplace. The researcher conducted personal interviews with 21 participants from the State Department of Infrastructure by visiting them at their workplace. These participants were actively involved in the department's functions that create, store and use knowledge.

Interviews allow the researcher to collect in-depth information from the respondents and helps in clarifying issues which could otherwise not be possible through other methods. Mugenda and Mugenda (2003:203) acknowledge that qualitative researchers interview participants to get in-depth information on a phenomenon. Advantages of interviews as stated by Creswell (2009:179) are that they are useful when participants can provide historical information and they allow researcher's control over the line of questioning. Interviewing allows clarification of unclear question(s). Disadvantages of using interviews are that: a researcher's presence may result into bias responses, not all people are equally articulate and perceptive, and interviews provide indirect information filtered through the views of interviewees (Creswell 2009:179).

### **3.5.1 Data collection instrument**

The study used a semi-structured interview guide to collect data. According to Ayres (2012), the semi-structured interview is a qualitative data collection strategy in which the researcher asks informants a series of predetermined but open-ended questions. The interview guide used for this study is presented in Appendix II. Ayres (2012) states that the interviewer may follow the guide to the letter, asking the questions in the order they are given, or the researcher may move back and forth through the topic list based on the informant's responses. Semi-structured interview guide allowed flexibility to ask further questions during the interview and the researcher was also able to control the discussion especially when an interviewee digressed. Wilson (2013) argues that semi-structured interviews guide provides some flexibility for interviewers and provides a mechanism for redirecting conversations that digress too far from the main topic.

### **3.5.2 Data collection procedure**

The researcher requested for permission from the State Department of Infrastructure to collect data through a written and formal letter (Appendix I). The researcher conducted face-to-face interviews with the participants using a semi-structured interview guide. The researcher called potential participants and scheduled for appointments on dates and time of their convenience. Polit and Beck (2012:183) advise researchers to record information from interviews by making handwritten notes. Therefore, the researcher made hand written notes while interviewing the participants.

### **3.6 Data analysis and presentation**

Data analysis is a process of bringing order and meaning to raw data. It is difficult to analyze data. Therefore, this process requires cleaning, coding and entering into a system such as a computer for analysis (Mvumbi and Ngumbi 2015:99). Data analysis forms the background for data presentation.

Steps of analyzing qualitative data as highlighted by Creswell (2009:190) entail:

- Organizing and preparing data for analysis;

- Reading through all the data and getting general sense of the information and reflecting on the meaning;
- Coding which involves taking text data, pictures gathered during data collection and segmenting sentences or paragraphs or images into categories and labeling that category with a term often based on the actual language of the participant;
- Using the code process to generate a description of the setting as well as categories or themes for analysis;
- Advancing how the description and themes will be represented in the qualitative narrative;
- Making an interpretation on or meaning of the data.

Following Creswell's (2009) qualitative analysis approach, the researcher gathered all notes made during the interview. The researcher read the compiled field notes from participants and used them to formulate keywords and themes based on the study's objectives. The researcher reread every participant's recorded responses per question, and manually coded and categorized them into keywords and themes that emerged from the data. Descriptive narrations were created under appropriate themes. Finally, the researcher interpreted the data.

### **3.7 Ethical considerations**

This study was guided by Unisa research policy (Unisa 2014). The current study took into consideration the following ethical issues: data integrity, plagiarism, informed consent, privacy, confidentiality and anonymity. In research, the integrity of data is of essence during data collection, analysis, and interpretation. Participants were provided with participant information sheet (Appendix III) containing a cover letter. The cover letter contained information regarding the researcher, purpose of the study, and why they were being invited to participate in the research. Further information in the cover letter were on where participants' details was obtained, their nature of participation in the study, if there was any negative consequences and benefits for participating in the study. Researchers should be honest to the whole range of research, including generating and analyzing data,

publishing results and acknowledging direct and indirect contributions of colleagues, collaborators, and others (Unisa 2014:5).

Participants were assured that their responses will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet at home for future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further research ethics review and approval if applicable. Hard copies will be shredded and/or electronic copies will be permanently deleted from the hard drive of the computer through the use of a relevant software programme. The researcher gave the report findings according to the data collected without changing it.

The researcher ensured confidentiality of participants through a participant data sheet that highlighted that their names were not being recorded and disclosed anywhere and to anyone and no one will be able to connect them to the answers they gave. According to Unisa (2014:15),

Researchers should maintain privacy, anonymity, and confidentiality of information in collecting, creating, storing, accessing, transferring and disposing of personal records and data under their control, whether these are written, automated or recorded in any other medium, including computer equipment, graphs, drawings, photographs, films or other devices in which visual images are embodied.

Plagiarism is a serious issue in academics. To avoid plagiarism, the researcher has acknowledged all sources used in compilation of this study and a reference list was provided. Plagiarism, falsification, fabrication of results and scientific misconduct, are serious offences (Unisa 2014:5). On informed consent, the researcher ensured the participants understood what the research study involved. Participants consented to participate in the research study by signing a consent agreement (Appendix IV). The researcher however noted all Participants did not agree to the audio recording of the face to face interview. Participation of individuals should be based on their freely given, specific

and informed consent. Further, participants should give their consent in writing and preferably accompanied by their signature (Unisa 2014:13).

### **3.8 Summary of the chapter**

This chapter examined the study's qualitative research approach, its advantages and disadvantages and research design. The study's population and purposive sampling technique used by the researcher has been presented. Data collection instrument (interview guide) has been discussed. Data collection procedure, ethical considerations and data analysis and presentation are presented in this chapter.

## **CHAPTER FOUR**

### **DATA ANALYSIS, PRESENTATION AND DISCUSSION**

#### **4.0 Introduction**

The findings of this study were attained as a result of research procedures described in Chapter Three. This study was based on a qualitative research approach using semi-structured interviews. An interview guide contained questions that were used as a guideline for the interview. Participants' responses were manually recorded. The study collected qualitative data which were thematically analyzed. Qualitative data include excerpts from documentation, interview transcripts, survey comments, focus groups transcripts, critical incident forms and field notes from observation (Bloomberg and Volpe 2012:2). These data is presented in the form of narrative text using content analysis. Bloomberg and Volpe (2012:17) state that findings of qualitative research are typically reported in a narrative manner.

#### **4.1 Data presentation**

Presentation of the study's findings was guided by the objectives of this study which were to:

- i. Establish the level of knowledge management awareness at the State Department of Infrastructure.
- ii. Find out knowledge management processes at the State Department of Infrastructure.
- iii. Identify types of ICTs used for knowledge management processes at the State Department of Infrastructure.
- iv. Identify challenges experienced by State Department of Infrastructure in the use of ICT for knowledge management.

In order to protect participants' identity, maintain their confidentiality and anonymity, the names of the participants are not revealed in this chapter.

## 4.2 Background of participants

Question one of the study's interview guide aimed at collecting participants' names (optional), section, position and duration worked at the State Department of Infrastructure. There are five divisions in the State Department of Infrastructure, namely: Materials Testing and Research, Mechanical and Transport, Kenya Institute of Highway and Building Technology, Roads and Support Services. These study findings are based on the 21 participants who are heads of sections.

Table 4.1 indicates that study participants had worked for various years in the State Department of Infrastructure. A total of 10 participants revealed that they had worked in the department for between 0 and 4 years. Participants who had worked for 5-9 years, 10-14 years and 15-19 years were three, three and one respectively. Three participants and one participant indicated having worked in the State Department of Infrastructure for three years. It is worth noting that the only participant with over 30 years working experience at the State Department of Infrastructure was a retiree hired on a contract basis.

**Table 4.1: Number of years worked at the State Department of Infrastructure**

Number of years worked	Number of participants
0-4	10
5-9	3
10-14	3
15-19	1
20-24	0
25-29	3
Over 30	1
<b>Total</b>	<b>21</b>

## 4.3 Interview themes

Qualitative data gathered were categorized into five themes. Further, sub-themes were identified and accordingly linked to each of the relevant main themes that emerged during the analysis of the participants' responses. Table 4.2 presents five themes where themes

one, two and three have various sub-themes. The major five themes for this study as identified in Table 4.2 were: knowledge management awareness, knowledge management processes, ICTs for knowledge management processes, challenges experienced in the use of ICTs for knowledge management processes, and any other contribution to make on the use of ICTs for knowledge management at the State Department of Infrastructure.

**Table 4.2: Interview themes and sub themes**

<b>Theme No.</b>	<b>Theme</b>	<b>Sub-themes</b>
1	Knowledge management awareness	1.1.1 Participants understanding of knowledge, knowledge management, tacit and explicit knowledge concepts
		1.1.2 Awareness of different types of knowledge
		1.1.3 Types of knowledge available at State Department of Infrastructure
		1.1.4 Ways in which knowledge management is included as a strategic objective of State Department of Infrastructure
		1.1.5 Importance of knowledge and knowledge management in the attainment State Department of Infrastructure objectives
2	Knowledge management processes	2.1 ways in which State Department of Infrastructure manage its knowledge
		2.2 mechanism in place at State Department of Infrastructure to facilitate the creation of the different types of knowledge
		2.3 Codification of knowledge at State Department of Infrastructure
		2.4 Knowledge retention at State Department of Infrastructure
		2.5 knowledge storage at State Department of Infrastructure



		2.6 knowledge sharing at State Department of Infrastructure
3	ICTs for knowledge management processes	3.1 Use of information and communication technologies for different knowledge management processes
		3.2 Types of information and communication technologies that State Department of Infrastructure uses for the different knowledge management processes
		3.3 How information and communication technologies enhance knowledge management processes
4	Challenges experienced in the use of ICTs for knowledge management processes	
5	Any other contribution to make on the use of ICTs for knowledge management at the State Department of Infrastructure	

#### **4.3.1 Theme one: Knowledge management awareness**

Knowledge management awareness forms theme one of this study's data analysis, presentation and discussion. This theme was derived from the first objective of this study pertaining to establishing the level of knowledge management awareness at the State Department of Infrastructure. Questions two, three, four, five and six of this study's interview guide were formulated to capture data on this theme.

Findings relating to theme one of this study were presented and discussed under five sub-themes, namely:

- Participants' understanding of various knowledge management concepts;
- Participants' awareness of different types of knowledge;
- Types of knowledge available at the State Department of Infrastructure;
- Ways in which knowledge management is included as a strategic objective of the State Department of Infrastructure; and
- Importance of knowledge and knowledge management in the attainment of the State Department of Infrastructure objectives.

#### **4.3.1.1 Participants' understanding of various knowledge management concepts**

The first sub-theme under knowledge management awareness sought to establish participants' understanding of four knowledge management concepts, namely: knowledge, knowledge management, explicit and tacit knowledge. A wide range of responses were given by the participants and noted under each knowledge management concept.

##### **Knowledge**

A total of 14 participants gave various definitions for the concept 'knowledge'. The 14 definitions of the term 'knowledge' were presented as follows:

*"Knowledge is accumulation of facts".*

*"Knowledge is information about relevant skills required".*

*"Knowledge is awareness, ability to carry out a task".*

*"Knowledge is communicated information from above".*

*"Knowledge is having information in relevant area".*

*“Knowledge is ability to understand so as to execute an action”.*

*“Knowledge is the know-how”.*

*“Knowledge is the skills or facts acquired by an individual or experience on an issue or some subject”.*

*“Knowledge is the extent of understanding your subject area”.*

*“Knowledge is information, documents, records and skills required”.*

*“Knowledge is empowerment to do things or skills to do something efficiently or better”.*

*“Knowledge is knowing and retaining lifelong skills”.*

*“Knowledge is academic qualification”.*

*“Knowledge is information held by an individual about work, experience and social environment”.*

Seven participants could not define the term “knowledge”. For instance, a participant stated that *“knowledge is a common term but difficult to define”.*

Davenport and Prusak (1998:5) define knowledge as a fluid mix of framed experiences, values, contextual information and expert insight that provide a framework for evaluating and incorporating new experiences and information. From the preceding analysis, it can be revealed that most of the participants were able to define the term ‘knowledge’ using various keywords. This shows participants’ awareness of the term ‘knowledge’.

Participants who were able to define the term, relied on their understanding of its meaning. In defining knowledge, participants used various terms such as: information, experiences,

skills, know-how, facts, ability, and knowing. Even though, it is important to note that a few of the participants did not know the meaning of the term ‘knowledge’. However, they acknowledge it to be a familiar term.

The preceding results illustrate that there was no consistent definition of the term ‘knowledge’ by participants. It is likely that inconsistency in defining the term ‘knowledge’ was due to lack of a common working definition at the State Department of Infrastructure. This finding concurs with Wu *et al* (2011) and Fombad (2014:61) who acknowledge that there has not been a unanimous conclusion to the definition of knowledge at present.

### **Knowledge management**

Twenty participants of the State Department of Infrastructure defined knowledge management. Responses on the definition of knowledge management were as follows:

*“Knowledge management is the application of academic skills to specific tasks”.*

*“Knowledge management is the way one manages knowledge that comes his way”.*

*“Knowledge management is classifying knowledge where it is required”.*

*“Knowledge management is using skills to get intended results”.*

*“Knowledge management is harnessing of knowledge for possible dissemination to others including enhancing its value”.*

*“Knowledge management is managing what one knows from employees”.*

*“Knowledge management is the way information and related resources are organized in an institution”.*

*“Knowledge management is the control of information”.*

*“Knowledge management is the utilization, harnessing of knowledge, skills for organization’s benefit”.*

*“Knowledge management is putting into practice the knowledge acquired properly”.*

*“Knowledge management is how one’s knowhow is managed. It is an experience inventory which facilitates sharing and future reference”.*

*“Knowledge management is making use of knowledge for the benefit of the institutions and its employees”.*

*“Knowledge management is the control of need to know. It is the choice of what knowledge is required”.*

*“Knowledge management is the ability to manage the task one is undertaking”.*

*“Knowledge management is receiving, processing, applying and disseminating knowledge”.*

*“Knowledge management is managing knowledge for reference purposes”.*

*“Knowledge management is the means of keeping, transferring, updating information stored in an organization”.*

*“Knowledge management is how to utilize the knowledge stored and passed from one person to the other for interaction”.*

*“Knowledge management is how information is organized so as to make sense out of it”.*

*“Knowledge management is being able to transfer knowledge to others and also to retain it within the organization for business continuity”.*

One participant did not define knowledge management. The participant stated the following:

*“I have heard of this term ‘knowledge management’ for the first time in this interview, I do not know its meaning at all”.*

From the preceding discussion, it is evident majority of the participants were able to define the term ‘knowledge management’. Participants used phrases such as: knowledge classification, knowledge organization and harnessing, knowledge dissemination, knowledge control and utilization, knowledge acquisition. Other terms used were: knowledge sharing for future reference, knowledge processing and application, knowledge storage, transfer and retention. Therefore, it can be inferred that majority of the participants had an understanding of the term ‘knowledge management’. In agreement to this finding, Na (2015) notes that there are various knowledge management definitions with numerous interpretations among authors.

The 20 study participants who defined knowledge management used terms advanced by scholars in various definitions of the concept. For example, Baporikar (2015) defines knowledge management as the acquisition and use of resources to create an environment in which information is accessible to individuals and in which individuals acquire, share and use that information to develop their own knowledge, and are encouraged and enabled to apply their knowledge for the benefit of the organization.

The study results demonstrate that majority of the staff at the State Department of Infrastructure were aware of the term ‘knowledge management’. This is in spite of no working definition of the term at the department. This factor could account for the inconsistent definitions advanced by participants.

Participants' definitions of knowledge management showed that they were aware of its value as they stated that as follows:

*“Knowledge management is being able to transfer knowledge to others and also to retain it within the organization for business continuity”.*

*“Knowledge management is managing knowledge for reference purposes”.*

*“Knowledge management is how to utilize the knowledge stored and passed from one person to the other for interaction”.*

*“Knowledge management is making use of knowledge for the benefit of the institutions and its employees”.*

*“Knowledge management is harnessing of knowledge for possible dissemination to others including enhancing its value”.*

### **Explicit knowledge**

Nine participants defined explicit knowledge. The definitions advanced were as follows:

*“Explicit knowledge is coded, can be seen and touched and easily transferable”.*

*“This is the documented, physical and touchable information”.*

*“Documented information”.*

*“Expressible knowledge, can be coded in a certain way”.*

*“This is a new term, I have heard of it today.....This is knowledge expressed in words and codes”.*

*“Formal knowledge by education, or knowledge accessed from existing source”.*

*“Tangible, transferable, retrievable in form of records and also in ICT systems”.*

*“It is documented knowledge, expressed in words such as orders from suppliers, invoices, copies of delivery notes, bids or tender document”.*

*“This is a new term, however, explicit knowledge are records”.*

*“This is a new term....it is directives, assignment, circulars, outright symbols”.*

*“Am not really sure on the definition but it is specific knowledge on manuals and procedures”.*

*“Obvious knowledge for example compulsory documents, it is the assumed knowledge in procedures.*

A review of the participants’ definitions of explicit knowledge shows usage of phrases such as: documented knowledge; coded; can be seen and touched; easily transferable; tangible; retrievable; recorded knowledge; and expressed in words. The terms used by the study participants to explain explicit knowledge reflect those in definitions advanced by various scholars (for example, Nonaka 1995; Polanyi 1966, 1998; King 2009). For instance, Nonaka (1995) states that explicit knowledge can be described as knowledge that is easily coded, transferred and shared within an organization.

A total of 12 participants stated that they were encountering the term ‘explicit knowledge’ for the first time. Participants gave the following feedback on the term ‘explicit knowledge’:

*“...it is self-explanatory”.*



*“This is a bit hard to define”.*

*“It is simple, clear and to the point knowledge”.*

*“Explicit knowledge is specific to particular area of activity”.*

*“This is knowledge gained from outside”.*

*“Hard or soft knowledge”.*

*“This skilled specified, clearly stated in one area of operation”.*

*“Am hearing of this term for the first time, it is the total awareness of the task one has”.*

The research results show that more than half of the study participants were unable to define the term ‘explicit knowledge’. Indeed, some participants stated that they were encountering the term ‘explicit knowledge’ for the first time and it was hard to define it. For illustration, one participant said that: *“Am hearing of this term for the first time, it is the total awareness of the task one has”*. Another participant said that *“This is a bit hard to define,”* Inability to define term ‘explicit knowledge’ apparently means participants did not understand the concept.

Inability to define explicit knowledge could be attributed to the failure of the State Department of Infrastructure to have a working definition of the term. Further, the department may have not explained to its staff the meaning and importance of explicit knowledge. This is because participants who defined or were unable to define the term ‘explicit knowledge’ stated that were encountering the concept for first time. One participant remarked that: *“This is a new term, however, explicit knowledge are records”*. Another participant noted as follows: *“This is a new term....it is directives, assignment,*

*circulars, and outright symbols*". Another participant's response was that: *"This is a new term, I have heard of it today... ....This is knowledge expressed in words and codes"*.

Lack of understanding of the meaning and importance of explicit knowledge by participants at the State Department of Infrastructure can hinder implementation of knowledge management within the organization. Nonaka and Takeuchi (1995) observe that employee conversion of knowledge from its tacit form to explicit form and vice versa are fundamental for knowledge creation in organizations. Public sector organizations create explicit and tacit knowledge (Gupta and Singh 2014:1639). These authors identify common sources of knowledge in public sector organizations as: visions and strategic plans, government documents, laws, rules and regulations, notifications and archives.

### **Tacit knowledge management**

Seven participants defined the term 'tacit knowledge' using different statements as follows:

*"This knowledge is held by an individual, it is inherent"*.

*"It is inherent knowledge acquired through experience"*.

*"Unseen unexpressed knowledge"*.

*"Hard to express, experiences, expertise in nature"*.

*"Held by an individual"*.

*"One that is not formally acquired by education but gotten by skills or experience"*.

*"These are skills, techniques, expertise, held by an individual or an organization"*.

A total of 14 participants gave feedback on the term 'tacit knowledge'. Their responses were as follows:

*“This is a new term, I have heard of it today I don’t know”.*

*“This term is difficult and new to me, what is it?”*

*“Tacit knowledge is more focused to a particular aspect”.*

*“Am not sure of that term”.*

*“Really this is a new term, I need to find out”.*

*“I know the term you are asking me to define is a common term however I cannot really explain what it is”.*

*“Am hearing of this term for the first time”.*

*“I don’t know”.*

*“I did not know there are various types of knowledge”.*

*“I only know of documented knowledge in records”.*

*“You re confusing me more, seriously, I cannot distinguish between tacit and explicit knowledge”.*

The foregoing findings indicate that some study participants had an idea of the term ‘tacit knowledge’. This is shown by phrases used in their definition of the term, such as tacit knowledge is: held by an individual; inherent; resident in the memory of human beings; unseen, and intangible. Other phrases were that tacit knowledge: is hard to express; denotes experiences acquired by an individual; and is informally acquired through skills or experiences. This understanding of participants is in line with Polanyi’s (1966, 1998)

definition that tacit knowledge is knowledge that is personal, intangible and embedded in the cognitive minds of people and is obtained through learning and experience.

In spite of the preceding, the study findings established that most of the State Department of Infrastructure participants were not familiar with the term ‘tacit knowledge’. The department seemingly does not have a working definition of the term ‘tacit knowledge’. Further, the department has not explained the term to its employees as some participants stated that it was a new vocabulary. Supporting this, are the following responses from participants:

*“This is a new term, I have heard of it today I don’t know”; “This term is difficult and new to me, what is it?”*

*“Really this is a new term, I need to find out”.*

It is likely that those participants who were aware of the term ‘tacit knowledge’ might have learnt it out of their personal efforts. Inability of participants to define tacit knowledge implies that they did not understand the term and this could/can hinder its creation in the organization. Therefore, the State Department of Infrastructure should explain to its staff that tacit knowledge is that knowledge inherent in employees’ mind acquired through work experience(s). Such knowledge can be shared amongst themselves through face-to-face conversations or discussions.

#### **4.3.1.2 Participants’ awareness of different types of knowledge**

The second sub-theme under participants’ knowledge management awareness was based on question three of the study’s interview guide. The question sought to establish different types of knowledge familiar to the participants. In their responses to this question, 10 participants gave their responses as reflected here:

*“As stated earlier in the definition above at the State Department of Infrastructure we keep documents, we hold meetings where we exchange a lot of work experience”.*

*“We have both knowledge as mentioned earlier, we have records, and we mentor young professionals where sharing our experiences”.*

*“We have tacit and explicit knowledge as discussed above.....there are registries and servers that store our documentations, surely, in this department it is made up of professionals with a lot of know-how”.*

*“The two types I explained above exists in our department.....am a retiree on contract, we have explicit knowledge on procedure manuals, again, am still sharing my experiences with fellow colleagues through consultations”.*

*“Yes we have the two knowledge as I reported above, we have minutes, circulars... and as you may be aware, and these are common records in government offices for communications. Employees over this place have a lot of know how.....what I mean is that, they have professional knowledge that they use to accomplish their task....by the way unspoken technical knowledge”.*

*“I would say we have procedure manuals, circulars, registries and servers.... we consult a lot with different professionals who share a lot of their technical know-how and experiences for example when doing a bridge or road....is it that tacit knowledge with our professionals?”*

*“There is a lot of documentation generated at the materials testing laboratories in form of reports, our staff in deed have the know-how. I would say these two knowledge exists in our department”.*

A total of 11 participants stated they did not know about categories of knowledge. Following are some of the comments from these participants:

*“How do you categorize knowledge?”*

*“Am hearing of these two terms, tacit and explicit knowledge for the first time”.*

*“.....actually as I stated earlier, am actually learning today that there are types of knowledge”.*

*“I sincerely don’t know”.*

*“.....you see I was not able to define actually all the terms above on knowledge management”. “This idea of knowledge management is too new to me and actually most if not all public employees at our place, therefore, we need to be trained on what it entails. For now I don’t know much about types of knowledge”.*

From the findings presented, it can be noted that some participants showed awareness of the two categories of knowledge by highlighting examples. The following responses demonstrate this awareness:

*“As stated earlier in the definition above, at the State Department of Infrastructure we keep document, we hold meeting where we exchange a lot of work experience”.*

*“Yes we have the two knowledge as I reported above, we have minutes, circulars... and as you may be aware, and these are common records in government offices for communications. Employees over this place have a lot of know how.....what I mean is that, they have professional knowledge that they use to accomplish their task....by the way unspoken technical knowledge”.*

However, some participants were not aware of various categories of knowledge. Some of them stated as follows:

*“As stated earlier in the definition above, at the State Department of Infrastructure we keep document, we hold meeting where we exchange a lot of work experience”.*

*“.....you see I was not able to define actually all the terms above on knowledge management”. “This idea of knowledge management is too new to me and actually most if not all public employees at our place, therefore, we need to be trained on what it entails. For now I don’t know much about types of knowledge”.*

The preceding findings can be interpreted to mean that participants who were not able to define tacit and explicit knowledge were also not aware of knowledge categories. For instance, a participant stated:

*“.....you see I was not able to define actually all the terms above on knowledge management”. “This idea of knowledge management is too new to me and actually most if not all public employees at our place, therefore, we need to be trained on what it entails. For now I don’t know much about types of knowledge”.*

Failure of understanding categories of knowledge among participants could consequently be affecting knowledge management implementation (knowledge creation, storage and sharing) at the State Department of Infrastructure. Apparently, the department has not raised awareness of tacit and explicit knowledge as a few staff can distinguish the two while others cannot. Ostensibly, participants who were aware of tacit and explicit knowledge are likely to have made deliberate efforts to learn on their own.

#### **4.3.1.3 Types of knowledge available at the State Department of Infrastructure**

The third sub-theme under knowledge management awareness was established through question four of the study’s interview guide. The question sought to find out types of

knowledge available at the State Department of Infrastructure. The participants' feedback on this question was varied.

On types of knowledge in their organization, 15 participants gave diverse responses. Some of the participants commended as follows:

*“There are road designs reports, maps and manuals. We also use our technical knowhow to execute our duties”.*

*“There are test, design and research reports, there is also one on one consultation with fellow engineers”.*

*“We have registries full of records, flash disks and servers that store our reports”.*

*“We hold departmental meetings where we share a lot of technical knowledge with colleagues”.*

*“We store hard and soft copies of reports, in fact, most of our human resource policies are in soft and hard copies. State Department of Infrastructure staff have a lot knowledge in their heads and also experience”.*

A total of five participants stated that only explicit knowledge is available at the State Department of Infrastructure as illustrated in the following remarks:

*“We have a disorganized library with several reports on test, research, road manuals, British and American standards on materials testing”.*

*“We have books and working manuals”.*

*“All I know is that our registries have files with records such personnel”.*

*“We have minutes of various meetings, circulars and work schedules”.*



*“Our registries stores hard copies of bids and tender documents, copies of procurement plans, public procurement Act 2015, delivery notes and prequalified suppliers list”.*

On explicit knowledge available at the State Department, one participant stated as follows:  
*“I don’t want to guess, sincerely I don’t know”.*

From the study findings, it can be noted that most of the participants were aware that both tacit and explicit knowledge was available at the State Department of Infrastructure. This is in agreement with Jain and Jeppesen (2013:348) who note that organizational knowledge exists in the form of explicit knowledge and tacit knowledge. Probably, the high response on this question was because the researcher clarified between tacit and explicit knowledge to participants who could not differentiate the two terms.

A few of the participants noted that only explicit knowledge is available at the State Department of Infrastructure. One participant was not aware of the types of knowledge available at the department. It is likely that the State department of Infrastructure has not raised awareness of tacit and explicit knowledge to all employees. The department may have not explained to its employees that tacit and explicit knowledge is created through four cyclical modes of knowledge creation known as Socialization, Externalization, Combination, and Internalization (SECI).

Nonaka and Takeuchi (1995) state that employees’ conversion of knowledge from its tacit form to explicit form and vice versa is fundamental for knowledge creation. Thus, they proposed the SECI model of knowledge creation which was used to guide this study. In this model, conversion of tacit knowledge to explicit knowledge takes place when all the four modes of knowledge creation (SECI processes) are organizationally managed to form a continual cycle.

#### **4.3.1.4 Ways in which knowledge management is included as a strategic objective of the State Department of Infrastructure**

The fourth sub-theme under knowledge management awareness informed question five of the study's interview guide. The question sought to find out ways in which knowledge management is included as a strategic objective of the State Department of Infrastructure. Various responses were made in respect to this sub-theme, and this enriched the study findings. Comments from three of the study participants were noted as follows:

*“The institution sponsors lecturers for post graduate programmes (masters and doctor of philosophy) while instructors are also sponsored for higher diploma programmes as per the human resource development policy”.*

*“Human resource development policy encourages continuous improvement of skills through training all public staff”.*

*“Induction training is compulsory for new staff according to the 2015 human resource development policy”.*

Four participants stated that compliance to quality standards was one of the ways in which knowledge management is included as a strategic objective of the State Department of Infrastructure. Some of the participants responded as follows:

*“We are ISO 9001:2008 certified requiring us to prepare procedure manuals of our processes”.*

*“Now, we are moving to the new ISO 9001:2015, and we will be required to comply on the new regulations, I understand it has a clause on organizational knowledge and records management”.*

The study established that few participants identified the human resource development policy and adherence to quality standards as the ways in which knowledge was included as

a strategic objective for the department under study. According to the Public Service Commission of Kenya (2015:17), knowledge management is considered as an approach for the development and capacity building. However, most of the study participants were not aware of the ways in which knowledge management is included as a strategic objective at the State Department of Infrastructure. Probably, the department has not considered knowledge management as a strategic objective, and if it has, this has not been communicated to its staff. Apparently, the department does not have a knowledge management strategy. Syed-Ikhsan and Rowland (2005:243) state that managing knowledge in an organization requires a knowledge management strategy that is well understood by all employees.

#### **4.3.1.5 How knowledge and knowledge management is essential in the attainment of the State Department of Infrastructure objectives**

The fifth sub-theme under knowledge management awareness sought to find out how knowledge and knowledge management is essential in the attainment of the State Department of Infrastructure objectives. Eleven participants stated that they used the department's reports in their offices for decision making. Following are some of the participants' remarks:

*“American and British roads and material standards at the library assists in decision making”.*

*“Once knowledge is managed it is easier to retrieve, store and share it for decision making”.*

*“Knowledge improves decision making”.*

*“Decision making bridges the gap between the suppliers and the buyers- value for money”.*

Knowledge was considered essential in the attainment of the State Department of Infrastructure objectives. As such, six participants noted that they refer to the

organizational knowledge for clarification purposes. Participants who noted their use of knowledge for clarification purposes gave various responses as follows:

*“You cannot remember everything, therefore we must keep referring to reports, standards and also maps as we work”.*

*“Knowledge is used for reference purpose, that is, it assists in compliance traceability of the test”.*

*“A learning institution will require manuals for reference purposes, in fact, students will require knowledge especially when they are compiling their research projects”.*

*“We have to keep referring to the procurement ACT before and during preparation of tender documents”.*

*“We have to refer to personnel’s’ records during their job appraisal.”*

Five participants stated that they used knowledge and guidelines for monitoring ongoing projects. Some of the participants’ remarks were as follows:

*“State Department of Infrastructure contracts some services like road and bridge construction, for monitoring purposes, the suppliers submits reports on the status of the project from time to time as per the agreement. We use our documentation to confirm if the supplier is meeting our requirement, specifications”.*

*“Knowledge assists a lot in monitoring progress on our various projects”.*

On the importance of knowledge and knowledge management in the attainment of the State Department of Infrastructure objectives, three participants gave various remarks as noted here:

*“With road construction, knowledge is key especially when implementing the project, engineers must refer to knowledge either through conversations or documented sources stored somewhere at every stage of the project”.*

*“Knowledge specifically, explicit, can be shared during projects implementation, documents for example a map can be reproduced in several copies and used by several engineers”.*

*“....surely while constructing a road, knowledge is critical. You will be required to use a map from time to time, for us engineers knowledge is critical, we must get the right mixtures from the word go.”*

Two participants said that knowledge and knowledge management can be used for business continuity. One of the remarks to back this finding was given by a participant as follows: *“You see some projects have phases, first’s phase knowledge is used as a background for the following or next phases”*. Other comments were also given by participants on the importance of knowledge and knowledge management in the attainment of the State Department of Infrastructure objectives. For instance, two participants said that *“knowledge and knowledge management is essential for innovation”*. Another participant stated that *“knowledge and knowledge management assists in research purposes”*.

From the foregoing, it is evident that all the 21 participants agreed that knowledge and knowledge management were essential in the attainment of the State Department of Infrastructure objectives. The participants noted that knowledge was used for decision making, reference, monitoring, research, project implementation, business continuity, creativity and innovation. This finding is in line with Mbhalati’s (2014) view of the benefits of knowledge management as conducive to enhancing public sector’s competence, promoting a healthy environment for e-government programmes, building and leveraging public intellectual property.

Mbhalati (2014) notes that knowledge management can be used to develop capable knowledge workers, help government agencies in Africa to improve on decision making,

enhance working relations and trust within government agencies. Therefore, by implementing knowledge management, the State Department of Infrastructure is likely to improve its organizational performance. This can be attained through increased efficiency that can consequently lead to streamlined processes and reduced work. From the study results, it can be interpreted that participants were aware of the importance of knowledge and knowledge management in the attainment of the State Department of Infrastructure objectives.

#### **4.3.2 Theme two: Knowledge management processes at the State Department of Infrastructure**

Knowledge management processes form theme two of data analysis, presentation and discussion. The theme focuses on the second objective of this study that sought to find out knowledge management processes at the State Department of Infrastructure. This was achieved through questions seven, eight, nine, ten, eleven and twelve of the study's interview guide.

The six sub-themes focused on in this section were:

- Ways in which the State Department of Infrastructure manages its knowledge;
- Mechanisms put in place at the State Department of Infrastructure to facilitate the creation of different types of knowledge;
- Codification of knowledge at the State Department of Infrastructure;
- Knowledge retention at the State Department of Infrastructure;
- Knowledge storage at the State Department of Infrastructure; and
- Knowledge sharing at the State Department of Infrastructure.

##### **4.3.2.1 Ways in which the State Department of Infrastructure manages its knowledge**

The sub-theme on ways of managing knowledge at the State Department of Infrastructure was based on responses to question seven of this study's interview guide. A total of 12

participants identified knowledge storage as one of the ways that the department uses to manage its knowledge. Some of the statements from the 12 participants were as follows:

*“We use the library to store most of our reports, and manuals”.*

*“To mitigate loss of information most of our reports are stored in the server as backup copies”.*

*“We store both hard and soft copies, some in the offices, library and the registry”.*

*“Department records are stored in the in the registry and offices”.*

*“In our section a lot of information is stored using an accounting system”.*

Nine participants said that the State Department of Infrastructure manages its knowledge by sharing through training, meetings and reports. The following are some of the participants’ responses:

*“We share knowledge using training, meetings and through emails”.*

*“We use reports to share findings on various soil tests”.*

*“All our research findings are shared through reports, technical meetings or through seminars”.*

Two participants observed that the State Department of Infrastructure used training and research as ways of creating knowledge. The participants stated the following:

*“A lot of knowledge is created through training, right now we are having induction training for newly employed engineers”.*

*“A lot of knowledge is created through research projects on emerging issues on roads and bridges”.*

Seven participants were not able to classify ways in which the State Department of Infrastructure manages its knowledge. Following are the participants’ responses on this issue:

*“Am not sure I think there are many trainings that takes place here”.*

*“Usually am not sure we have departmental meetings or provide attachment to students from universities”.*

*“Am not sure scheduled meetings to review manuals and induction programs are part of managing knowledge”.*

*“I didn’t know that training offered here were managing knowledge. I took it as usual, that is, we are taught and we resume our duties”.*

From the findings, it can be inferred that the State Department of Infrastructure manages its knowledge through creation, storage and sharing. Knowledge storage was rated as the most commonly used way of managing the department’s knowledge. This was followed by knowledge sharing, and lastly knowledge creation. It should be noted that seven participants stated that they were not able to state how knowledge is managed at the State Department of Infrastructure.

Table 2.2 of this study identified knowledge management processes as consisting of knowledge acquisition, capturing, creation, storage, sharing, transfer and reuse. However, it is important to note that Allameh *et al* (2011:1212) indicate that there is no agreement



over knowledge management processes. Therefore, due to different scholars' points of view, there are three to eight successive levels of knowledge management activities which also overlap each other.

The State Department of Infrastructure manages its knowledge through storage, sharing and creation. Probably, the department needs to raise awareness to its staff on the ways to manage its knowledge. Participants suggested the following measures to raise knowledge management awareness at the State Department of Infrastructure:

*“The State Department of Infrastructure should have a knowledge management officer to advice on how to manage organizational knowledge”.*

*“To train State Department of Infrastructure staff on knowledge management”.*

Raising awareness on how to manage knowledge will benefit the State Department of Infrastructure. This is because its staff will be able to use various ways of creating, storing and sharing valuable organizational knowledge. Probably, there is no document guiding on ways of managing knowledge at the State Department of Infrastructure. Subsequent sub-themes in sections 4.3.2.2 - 4.3.2.6 explain findings of how knowledge is managed at the State Department of Infrastructure.

#### **4.3.2.2 Mechanisms in place at the State Department of Infrastructure to facilitate the creation of different types of knowledge**

Question eight of the interview guide sought to establish mechanisms put in place at the State Department of Infrastructure to facilitate the creation of different types of knowledge. Thirteen participants said that training is among the mechanisms put in place at the State Department of Infrastructure to facilitate knowledge creation.

On training as a mechanism put in place at the State Department of Infrastructure to facilitate knowledge creation, some of the participants remarked as follows:

*“There are various trainings that take place here for knowledge creation; they include induction training, on job training, training by contracted retirees”.*

*“The department ensures that its staff have attended in-house or external training as one way of creating knowledge”.*

*“Inductions trainings are compulsory for all new employees in public organization, ours included”.*

Participants also gave the following responses on the mechanisms in place at the State Department of Infrastructure to facilitate the creation of different types of knowledge:

*“A lot of knowledge is created through technical meetings especially for the young engineers”.*

*“Departmental meetings aid in knowledge creation especially when held before commencement of a project and after, that is, on its completion”.*

*“Intranet is one the mechanism for knowledge creation at the State Department of Infrastructure”.*

*“One of the ways we create knowledge is by providing laboratories both space and equipment to students and researchers to carry out their practical”.*

*“Experienced engineers are paired with newly and young engineers so as they can transfer their experiences as well as induct them into the profession”.*

*“Retirees recalled on contracted mentor junior staff in their areas of specialization for knowledge creation”.*

Two participants stated that the State Department of Infrastructure uses research as a mechanism of creating knowledge. One participant remarked that *“a lot of knowledge is created through research projects on emerging issues on roads and bridges”*. The other

participant stated that “*periodically we carryout research to establish the road use*”. One participant stated that the State Department of Infrastructure provided testing laboratories to universities and colleges for knowledge creation. This is in line with Ogiwara (2013:57) on how A\*STAR, a lead agency in Singapore fosters world-class scientific research and talent.

A participant stated that the State Department of Infrastructure uses emails via intranet for communication among fellow engineers especially when clarifying work-related issues. Wahroos (2010:11) says that many organizations have integrated social media applications into their intranets. Chatti *et al* (2007) add that social media provide great opportunities to build such spaces and hand on tacit knowledge from one person to another.

Findings of this study revealed that the State Department of Infrastructure creates knowledge using various mechanisms. Thirteen participants stated that knowledge is created through inductions and on-job training. Eleven of the participants noted that technical meetings were used to create knowledge within the department. Three participants remarked that the department uses mentorship as a way of creating knowledge. These findings are in line with Edge 2005; Nair 2013; Yasin 2013 and Mosha 2017, who identified mechanisms for knowledge creation as training, meetings and mentoring.

Public sector organizations create knowledge using training, storytelling and meetings. Shajera and Al-Bastaki (2014) acknowledge that the public sector is knowledge-intensive because it generates a lot of tacit and explicit knowledge through various means. For example, meetings, brainstorming and conversations via tea and lunch breaks, emails, phone calls, conferences, workshops and also through informal meetings. In agreement, Yasin (2013:64) notes that MARDI, a public-sector funded and research and development institute in Malaysia encourages tapping into tacit knowledge through various mechanisms. Yasin (2013:64) identifies MARDI’s mechanisms for creating tacit knowledge as follows:

- Brainstorming sessions for policy and planning, coaching and mentoring for human resource development;

- Innovative and creative circle for improvement in work process;
- Forums to exchange ideas and perspectives;
- Public lectures to share research findings;
- Structured interviews to gauge knowledge in specific areas;
- Assignment analyses to benchmark work process.

It seems that knowledge creation at the State Department of Infrastructure happens unknowingly. Therefore, there is need to raise staff awareness on knowledge creation at the State Department of Infrastructure. Nonaka and Takeuchi (1995) describe knowledge creation as a dynamic and continuous process involving the acquisition, accumulation, creation and exploitation of new tacit and explicit knowledge. The State Department of Infrastructure can leverage on the knowledge it is creating for competitive products and services, problem-solving and mitigating losses. Jinwon, Lee, and Oneki (2016:1) observe that knowledge creation helps firms to develop new products and services to respond quickly to market requirements.

#### **4.3.2.3 Codification of knowledge at the State Department of Infrastructure**

The researcher sought to establish how knowledge is codified at the State Department of Infrastructure. Twelve participants stated that they used reports for codifying knowledge. Some of the participants remarked as follows:

*“We compile reports after technical meetings and quality audits on ongoing projects”.*

*“We must submit a report on how our leased equipment are performing”.*

*“Once we carry out a material’s test, we must submit a report to our clients”.*

*“We are required to submit a report after attending a departmental sponsored training”.*

Seven participants noted that they used manuals for knowledge codification. Following are some of their remarks on this issue:

*“With Quality certification, we are required to prepare manuals on how some of our processes are executed”.*

*“There are several manuals on how to carry out various tests in the laboratory”.*

*“Manuals assists in completing tasks.....they must be in place in our section”.*

Three participants observed that minutes were used for codifying knowledge at the State Department of Infrastructure. Some of their comments are as follows:

*“Minutes are compiled whenever we have departmental meetings”.*

*“Minutes captures our meetings deliberations”.*

Two participants stated that they used forms for knowledge codification. One of these participants stated as follows *“We use forms to capture an equipment’s daily utilization schedule, then these details are entered in the excel work sheet”.*

Two participants noted that they used circulars for their communication in the department under study. One of these participants noted that *“state Department of Infrastructure uses circulars for their communication”.* The other participant commended that *“one method of communication at the department, in fact all state departments is through circulars”.*

Two participants identified employee data as a means of codifying knowledge at the State Department of Infrastructure. One of these participants remarked as follows: *“We use databases to capture employees’ details”.* The other participant noted as follows: *“We have created databases that captures employees training needs”.*

Two participants identified face-to-face communication as a mechanism for knowledge creation at the State Department of Infrastructure. A remark by one of these participants was as stated follows: *“We hold braining storming sessions especially before a major project...here face to face conversation is encouraged on how to tackle a scheduled project”*. The other participant reiterated that *“face-to-face conversations are encouraged between engineers in our departments...you also need to note that we consult a lot with our stakeholders via telephone conversations”*.

From the preceding, it is evident that the State Department of Infrastructure codifies its tacit knowledge through brainstorming and conversations (face-to-face and telephone). Explicit knowledge in the department is codified through reports, manuals, minutes, forms, circulars and databases. Nonaka and Takeuchi (1995) acknowledges that employee conversion of knowledge from its tacit form to explicit form and vice versa is fundamental for knowledge creation and proposed the SECI model of knowledge creation.

Findings from this research revealed that the State Department of Infrastructure codifies tacit knowledge through brainstorming and conversations. However, apparently there is need to codify more knowledge in the department through storytelling, formal meetings, emails, workshops and seminar training. It is appreciated that the public sector is knowledge- intensive as it generates a lot of tacit and explicit knowledge through meetings, brainstorming and conversations, emails, phone calls, conferences, workshops, and informal meetings (Dewah and Mutula 2012:363; Shajera and Al-Bastaki 2014).

The State Department of Infrastructure can leverage on codified knowledge for competitive advantage and innovation. Mungai (2014:112) established that lack of codification of success stories of tacit knowledge could lead an organization to encounter challenges. These challenges are costly and they include: reinvention of the wheel, loss of time when process reengineering is involved, reduced productivity and inefficiency in execution of projects. The findings presented in this section of the study confirm and strengthen the findings established in section 4.3.1.3 on types of knowledge available at the State Department of Infrastructure.

#### 4.3.2.4 Knowledge retention at the State Department of Infrastructure

Knowledge retention is an important knowledge management process. Therefore, the researcher sought to establish how State Department of Infrastructure retains its knowledge. Eleven participants said they used reports for retaining knowledge at the State Department of Infrastructure. Some of the participants' statements were given as follows:

*“Reports are the best for retaining knowledge especially from contracted consultants”.*

*“Submission of reports is mandatory for all contracted works, otherwise the department will not have any findings from any project and this will interfere with our progress”.*

*“Reports informs on progress especially when we have contractors on site”.*

Seven participants observed that the State Department of Infrastructure retains its knowledge through contracting retirees. Some of the participants' comments were as follows:

*“Retirees have a lot of knowledge accumulated for a long period, we retain them so that they can train others on their areas of specialization. ....remember, they must provide notes to their trainees”.*

*“Retirees are hired on contracts as consultants to train others on their areas of specialization”.*

*We only contract retirees who have special skills and as you know, we did not capture their specialized expertise before their retirement”.*

Six participants stated that registries were used in retaining knowledge at the State Department of Infrastructure. For instance, some of these participants remarked as follows:

*“We have several registries where we store records”.*

*“Our registry is disorganized, however, am aware they store records that can be referred in future”.*

Four participants said that succession planning was also among the ways of retaining departmental knowledge. Some of them remarked as follows:

*“Succession planning should be happening but am not sure if happens”.*

*“Succession planning takes place as a way of retain knowledge especially when one employee dies or retires”.*

Four participants identified mentoring and coaching as ways of retaining departmental knowledge. Remarks made by participants on this were:

*“Junior staff are mentored by the senior staff. This is encouraged on all projects”.*

*“Staff are attached to a contracted retirees for monitoring and coaching”.*

*“All head of section mentor and coach their staff”.*

Three participants said they used the archives for knowledge retention in the State Department of Infrastructure. For instance, one participant remarked as follows: *“We use archives for knowledge retention in the department”.*

Two participants noted that databases were used for retaining departmental knowledge. One of these participants said that *“databases are used for retaining departmental knowledge”*. Another participant remarked as follows: *“We started backing up staffs’ knowledge after one of our key and long serving staff died while on duty and we lost a lot of knowledge, we cannot risk again”.*



From the foregoing, it was established that the State Department of Infrastructure uses registries, reports, training, archives, databases and backups for knowledge retention. Further, the department's knowledge retention was achieved through mentoring, coaching, succession planning and contracting retirees. Agarwal and Islam (2015) state that there are system-based knowledge sharing and people-based knowledge sharing. The former is concerned with the documentation of knowledge, training and using a digital repository system to store knowledge. The latter uses strategies such as mentoring, coaching, job shadowing, networking, storytelling and a community of practices. Kim (2005) adds that knowledge retention is all the activities, databases and repositories that capture, preserve and archive organizational knowledge.

The results of this study show that the State Department of Infrastructure was using system-based knowledge retention strategies more than people-based knowledge retention strategies. System-based knowledge retention strategies employed at the department are: reports, registries, archives, databases, and backups. For people-based knowledge retention strategies, the department uses mentoring, coaching and contracting retirees. Knowledge generated from people-based strategies involves conversation ultimately generating tacit knowledge. The knowledge generated may be required by the State Department of Infrastructure for decision making in solving an existing problem or for creating new products and services.

#### **4.3.2.5 Knowledge storage at the State Department of Infrastructure**

Question eleven of the study's interview guide sought to establish how knowledge is stored at the State Department of Infrastructure. Sixteen participants said that they used registries for knowledge storage. Some of the participants stated as follows:

*"We use registries to store our records. We have two registries main and secret".*

*"We have a registry where our departmental correspondences are filed".*

*"Our laboratory tests results are deposited and dispatched to clients at the registry".*

*“We store department’s personnel files at the registry”.*

*“All tender applications are stored in the registries”.*

*“Our audit reports are stored the section’s registry”.*

Thirteen participants stated that they used computers in their offices for knowledge storage at the State Department of Infrastructure. On the use of computers for knowledge storage, some of the participants remarked as follows:

*“We use computer servers to store reports”.*

*“We store reports in the departmental server and deposit hard copy (ies) in the library”.*

*“We used to store our reports in the servers unfortunately they broke down and they are not yet repaired”.*

Seven participants stated that they used the State Department of Infrastructure archives to store their organizational knowledge. Remarks made by some of these participants were as follows:

*“State Department of Infrastructure have an archive however it is inaccessible”.*

*“I know there is a departmental archive, which is disorganized, and I have difficulties retrieving documents”.*

*“There is an archive which is disorganized and unmanned”.*

Five participants noted that the State Department of Infrastructure had a library that houses its reports, maps, manuals and standards. Some of the participants noted as follows:

*“We have a library that stores various reports however, it is disorganized”.*

*“There is a library that stores reports and standards, the only problem is that is disorganized and not automated”.*

*“Our library stores reports, maps, standards and manuals. The only challenge is that it is disarranged; in fact, it takes a long time to retrieve documents. There is no a library catalogue and a method of borrowing, for example, reports”.*

Three participants stated that they used computer servers for knowledge storage. Some of the remarks made were as follows:

*“With our servers down, we are using external hard drive for storing reports”.*

*“We use external hard drive as backup for our documents”.*

Three participants noted that they stored their organizational knowledge in their workplace offices. Following are some of the participants’ remarks on this issue:

*“We store some of our records in the office cabinets and on tables. In fact as you can see, all these reports on the table are for a just completed audit”.*

*“I prefer having these reports in the office for ease of access, they contain everything I require”.*

A participant stated that the State Department of Infrastructure stored its knowledge the website of the Ministry of Transport, Infrastructure, Housing, and Urban Development in the government of Kenya. This is the parent ministry under which the department is placed. The participant stated that *“we use the ministry’s website to store tender documents”*.

Findings of the study revealed that the State Department of Infrastructure stores its knowledge using registries, archives, libraries, offices, computer servers, external hard

drives, and parent ministry's website. A further discussion of knowledge storage using computer servers, external hard drives and website is presented under section 4.3.3 of this study and it focuses on ICTs used for knowledge management processes.

The research results also established that some of the methods used for knowledge storage such as the library and archives are disorganized. In addition, the computer server had broken down and this was hindering access and retrieval of information. The State Department of Infrastructure staff can likely search and retrieve its document faster if its repositories are organized and centralized facilitating timely decision making and better services.

The findings of the study determined that the State Department of Infrastructure used various methods for knowledge storage. This is considered important for knowledge management in the organization. Pandey (2014:155) recommends that once knowledge has been created, acquired or collated, it should be stored in repositories so that individuals, groups and organizations can have access to it.

Shabane (2017:168) advises that in order for the public service to be successful, it needs to start capturing, documenting and keeping the knowledge held by employees in a database. This is crucial for employees set to retire as it ensures that there is a stock of knowledge that can be re-used by newly appointed employees. Such an approach can be useful for business continuity at the State Department of Infrastructure because when a staff member retires, exits the organization or dies as his/her knowledge of value is preserved in department's archives, libraries and the registries.

#### **4.3.2.6 Knowledge sharing at State Department of Infrastructure**

Question twelve of the study's interview guide sought to find out how the State Department of Infrastructure shares its knowledge. A total of 15 participants said they document sharing was used. Some of the responses from participants were as follows:

*“Our section deposits a copy of reports generated to the library for members to read them”.*

*“Official communication is shared to all staff through letters, circulars, memo and reports”.*

*“At State Department, our work is interrelated, therefore a lot of documents sharing is done with a team of say engineers, surveyors, geologists, physicists”.*

*“All staff who attend a training out of the country are required to share reports with the rest”.*

*“In a learning institution there is a lot of document sharing for example, case studies and lecture notes between lecturers and learners”.*

*“In the tendering processes, suppliers to the department share their quotations and other bidding documents to the State Department of Infrastructure tendering committee for consideration”.*

*“We have to share road design reports for discussions with a technical committee before the final reports are compiled”.*

The study findings revealed that 15 participants stated that knowledge was shared at the State Department of Infrastructure through documents using minutes, technical reports, circulars, memos and lecture notes. This is in line with Ekeke (2011:260) who says that in the case of explicit knowledge minutes in files conveying management decisions, memos and minutes of meetings are the most applied mechanisms during knowledge sharing.

A total of 13 participants said they used training for sharing knowledge in their organization. Their responses are in the following comments:

*“Usually we carry out a survey to identify existing skills gaps so that our staff are trained through seminars, or sponsored for post graduate studies”.*

*“On job training, inductions, seminars are some of the ways the State Department of Infrastructure use to share knowledge with fellow colleagues. The young professionals joining the institution undergo induction training for two weeks”.*

*“State Department of Infrastructure organizes for workshops and conferences where a lot of knowledge is shared”.*

*“The department sponsors qualified staff to undertake post graduate studies within and outside the country”.*

Knowledge sharing at the State Department of Infrastructure through meetings was identified by 13 participants as noted from the following select statements:

*“We have site meetings for sharing knowledge on a common project with various stakeholders especially agencies and contractors”.*

*“There are departmental meetings where members share progress on a given project. These meetings are important for sharing ideas especially during project execution. It is likely a solution is provided by the team members”.*

*“Although am not sure if this is the in line with the information you are collecting, we have brainstorming meetings before commencement of a project with key project team. Numerous ideas are shared and solutions provided.”*

*“We must have departmental meetings to discuss draft reports before compiling final reports”.*

Nine participants said that they used mentoring for sharing knowledge at the State Department of Infrastructure. Some participants stated the following:

*“Our staff are retiring at an alarming rate, we therefore have to pair a young professional with one nearing retirement. The older professional shares his experiences to his juniors”.*

*“Mentors demonstrates practically to the mentee on how some work procedures are executed”.*

*“Mentors shares a lot of knowledge on how to solve some technical problems by being paired with a mentee(s)”.*

*“In most cases experience acquired by mentors are not documented so the mentees can acquire it through a conversation with the mentor who acts like a coach on a specified technical area”.*

Six participants acknowledged that they shared knowledge through interpersonal conversations as reflected in their responses.

*“This conversations are more informal, usually takes place at break time especially when a colleague shares, for example, his experiences from a seminar or workshop or work related tours”.*

*“We hold telephone conversations with fellow colleagues especially at the regional offices and share necessary information on a given issue”.*

*“We receive feedbacks on various projects through conversations in form of briefings. If there is a need for action, it is executed immediately”.*

Two participants indicated that they shared knowledge through industrial attachments. Participants' views on this issue were as follows:

*“The department provides attachment to college and university students. This way, for example, engineers shares a lot of their experiences”.*

*“We provide attachment to students for a period of three months. We ensure they have visited each departmental section. This way they learn in their related areas”.*

From the study findings, it was observed that the State Department of Infrastructure shared its knowledge through training. This is in line with reviewed literature in section 2.8.3 of this study. Training is used for sharing knowledge in the public sector (Biygautane and Al-Yahya 2010; Ramohlale 2014; Mosha 2017; Janus 2016). Public Service Commission of Kenya (2015: xi) states that effective training and development benefits both the individual and the organization through sharing of ideas and dissemination of good practices. This results into efficient and effective organizational performance.

Public Service Commission of Kenya (2015:12-14) has provided structured training programmes at different levels within public officers’ careers. The programmes include: induction, competency-based training, certificate, diploma, undergraduate, masters and PhD courses. Public Service Commission of Kenya (2015:15) has also listed human resource and development capacity building programmes such as talent management, career guidance and counselling. Other programmes identified are: mentoring, coaching, role modelling, knowledge management, industrial attachment, internship, secondment, research and development.

Study findings showed that 13 participants used meetings as a way of sharing knowledge at the State Department of Infrastructure. Mungai (2014:109) confirms that KIPPRA uses formal avenues such as meetings, training, discussion groups, workgroups, round tables and mentorship for sharing tacit knowledge internally and externally. Findings of the study found out that nine participants reported using mentoring as a knowledge sharing mechanism at the department under study. According to Public Service Commission of Kenya (2015:17), mentoring is an approach to human resource development which involves transfer of knowledge, skills, attitudes and competencies from the mentor to the



mentee. Biygautane and Al- Yahiya (2010) add that Dubai's Roads and Transportation Authority captures tacit knowledge from external consultants through different methods like mentoring, coaching and informal meetings.

The study established that six participants at the State Department of Infrastructure used conversations to share organizational knowledge. According to Nair (2013:16), IE in Singapore is a government agency that has developed programmes such as storytelling to capture employees' overseas experiential knowledge. The knowledge captured is used to help those who are going to be posted abroad. He further notes that to promote greater knowledge sharing, tea sessions called the "Passport Series" provide the staff with the opportunity to listen first hand to the Regional or Center Directors' experiences. This accelerates knowledge acquisition in an informal setting.

From the findings, it was noted that two participants at the State Department of Infrastructure used industrial attachments to share knowledge. Public Service Commission of Kenya (2015:18) recognizes industrial attachment as an important component of education and training. It provides interns with opportunities to acquire practical aspects of their respective areas of specialization in a real workplace environment. Further, it is recognized that the government of Kenya supports industrial attachment by providing opportunities to students in tertiary and higher education institutions.

In a nutshell, the study results revealed the State Department of Infrastructure employs various methods of sharing knowledge. For example, document sharing, mentoring, training, meetings, industrial attachments and interpersonal conversations. The use of these methods is supported by O'Brien (2014). The author identifies formal knowledge sharing mechanisms such as training sessions, plant tours, apprenticeships, employee transfers, and a variety of information technology tools that enable collaboration. Further, O'Brien (2014) states that informal mechanisms such as coffee break conversations, unscheduled meetings, and informal seminars have also been promoted as a means of sharing knowledge.

The researcher noted that not all participants were aware of knowledge sharing methods at the State Department of Infrastructure. Therefore, there is need to raise awareness of the methods used for knowledge sharing and the importance of sharing knowledge at the State Department of Infrastructure. Effective sharing knowledge can help the department in decision making. This is because employees will be able to make and execute decisions rapidly when individuals throughout the organization gain access to important strategic ideas.

Lack of or little knowledge sharing at the State Department of Infrastructure probably can affect knowledge creation. This is in realization that knowledge sharing brings forth several benefits to an organization that adopts it. This is crucial for the public sector organizations which generally engage in many activities and programmes, create a lot of knowledge, and interact with many stakeholders.

Mosha (2017:95) lists advantages of knowledge sharing as follows:

- Knowledge sharing enables people to contribute and participate in knowledge production which can later be accessed, retrieved and stored for future development of the institution;
- Knowledge needs to be transferred from where it is created or stored to where it is needed to be communicated and shared effectively;
- Knowledge sharing makes people to be very creative by finding new knowledge to be shared with others;
- Knowledge sharing leads to creation of new knowledge within the organization;
- Knowledge sharing builds trust and relationships between employees and employers.

#### **4.3.3 Theme three: Information and communication technologies for knowledge management processes**

ICTs for knowledge management processes forms theme three of data presentation, analysis and discussion. It is based on the third objective of this study. The objective sought to identify types of ICTs used for knowledge management processes at the State

Department of Infrastructure. This was achieved through questions thirteen, fourteen and fifteen of the study's interview guide. Responses to these questions were presented and discussed under the following sub-themes:

- Use of ICTs for different knowledge management processes at the State Department of Infrastructure;
- Types of ICTs used for different knowledge management processes at the State Department of Infrastructure;
- How ICTs enhance knowledge management processes at the State Department of Infrastructure.

#### **4.3.3.1 Use of information and communication technologies for different knowledge management processes at the State Department of Infrastructure**

Question thirteen of the study's interview guide sought to establish ICTs used for knowledge management processes at the State Department of Infrastructure. A total of 17 participants stated that there are ICTs used in the department. However, they were not aware how they were used for knowledge management processes. Some of the participants remarked as follows:

*"We do not have a knowledge management policy or a document that guides on what information and communication technology to use for knowledge generated at the department. We have the desktops that we use for creating memo, letters, and reports".*

*"I use emails however, am not sure how emails can be used for managing knowledge".*

*"There are these government management information system such as integrated personnel and payroll database, government human resource information system, integrated finance management information system that we use for our daily*

*department operations otherwise am not sure how they are used for knowledge management”.*

*“I use Microsoft excel but am not sure how it can be used for managing knowledge”.*

*“We use finance management information system but cannot explain how it is used for knowledge management”.*

*“We use backups using external hard drives however am not sure how it is used for knowledge management”.*

*“I have heard about knowledge management concept for the first time during this interview, I agree we use information and communication technologies such as emails, finance management system for our daily operations however, am not sure how they are used for managing knowledge”.*

Four participants noted that they used ICTs for knowledge management processes as supported by the following select statements:

*“The ministry’s website is used to share knowledge on the department tenders”.*

*“Emails are used for sharing documents”.*

*“Information management systems in the department are used to store staff’s personal information”.*

*“Laptops and desktops are used for information storage”.*

*“Hard drives are used as backup storage devices”.*

Findings of the study revealed that the State Department of Infrastructure was using ICTs such as such as: desktop computers, emails, laptops, Microsoft applications, parent ministry's website, information systems and external hard disks. There are several ICTs used for knowledge management processes. For example, data warehouse, document management systems, searching and indexing systems, intranet, help desk applications, data mining, collaboration technologies and Web 2.0 technologies. These ICTs were also identified in this study's literature review as cited from various authors (for example, Alavi and Leidner 1999; Jackson 1998; Tyndale 2002; Fombad 2008; Uriarte 2008). However, the researcher established that 17 participants were not sure if the available ICTs were used for managing different types of knowledge at the State Department of Infrastructure.

Ignorance on ICTs used for management of knowledge at the State Department were exemplified in the following statement by a participant:

*"There are these government management information system such as integrated personnel and payroll database, government human resource information system, integrated finance management information system that we use for our daily department operations otherwise am not sure how they are used for knowledge management".*

According to Nazim and Murkerjee (2016), knowledge management practitioners use a wide range of information technology tools to create, store and share knowledge. Romohlale (2015:138) adds that although knowledge management does not depend entirely on technology, there is an impact and a role ICTs play in managing the know-how of the people.

Findings from the study revealed that four participants were aware of ICTs for knowledge storage and sharing. McNabb (2006:51) lists ICT tools used for knowledge storage such as knowledge repositories, electronic bulletin boards and databases. Biygautane and Al-Yahya (2010) add that when Dubai court judges finalize a case and announce the verdict, they are required to electronically store the case details and explain how they reached a

certain decision for future references by other judges with a similar case. Other participants in this study stated that they used ICTs for knowledge sharing such as the ministry's website. Literature reviewed in section 2.9.4 of this study explains various ICTs used for knowledge sharing such as intranet, dedicated portal, blogs e-learning platforms, Lotus notes, emails (Bunyagidj *et al* 2013; Kim 2013; Nair 2013; Yasin 2013).

The preceding discussion of the study results show that there was an ICT infrastructure at the State Department of Infrastructure. Nevertheless, seemingly there is lack of awareness on what ICTs are used for knowledge management processes at the department. This could probably be due to lack of a policy on ICTs use for knowledge management processes. According to Dei (2017:215), lack of awareness of ICT tools among some staff members could impede their motivation for creating and sharing knowledge. One participant made the following statement:

*“We do not have a knowledge management policy or a document that guides on what information and communication technology” to use for knowledge generated at the department”.*

It seems that the State Department of Infrastructure was not using ICTs for knowledge creation. The department needs to consider using ICT tools such as wikis, blogs, Facebook, Twitter, intranet, and e-learning platforms for knowledge creation. Use of such tools is noted in a study by Mosha (2017:201). The research found out that majority of public university librarians in Tanzania use Skype, wikis, blogs, Facebook, phones and Google Talk for knowledge creation and sharing. They also participate in group discussions through Facebook and blogs.

#### **4.3.3.2 Types of information and communication technologies used for knowledge management processes at the State Department of Infrastructure**

Ten participants stated that they used emails for creating and sharing documents. Following are select participants' comments:

*“Although our internet connection is weak, we use emails to send documents to fellow colleagues”.*

*“At times I require a certain document and am not in the office, I request it is emailed.”*

*“Some of our clients want their documents to be emailed as they await the hard copy.”*

*“We request tenderers application documents via the email.”*

Eight of the study participants remarked that they used mobile phones for sharing knowledge as captured in the following select remarks:

*“We communicate with regional staff on various projects either through short messages or through mobile conversations”.*

*“We are actually facilitated with mobile’s air time for communicating with other officers in the field”.*

Eight participants also noted that they used ICTs for knowledge storage and sharing as exemplified in the following select remarks:

*“There are common information management systems that are used by all public sector organizations. These management information systems include integrated personnel and payroll database, government human resource information system, information finance management information system. These systems are used for knowledge storage and sharing”.*

*“A participant stated that integrated personnel and payroll database stores public service staff information such as date of employment, career progression, trainings undertaken and dates of retirement”.*

*“Government human resource information system stores and shares information to public employees. It stores public service personnel performance records, training gaps and stores staff pay slips. On sharing, Staff can download and upload information such as such as performance targets, human resource budgets and training schedules”.*

Eight participants further stated that they used the parent ministry’s website for knowledge storage and sharing. The State Department of Infrastructure is under the Ministry of Transport, Infrastructure, Housing, and Urban Development (Ministry of Transport, Infrastructure, Housing, and Urban Development 2016). A participant stated as follows:

*“As a division we do not have a website, however, we use the ministry’s website. The website is used for document storage and sharing. Members of the public use the ministry’s website to download, for example, tender documents”.*

Six participants stated that they used Microsoft office application for sharing and storage especially the MS PowerPoint used during training. A participant remarked as follows:

*“Microsoft office presentation application, Power Point, is used for preparation of slides for knowledge sharing at in-house training”.*

Two participants said that they use the parent ministry’s Facebook and Twitter accounts for communication. One of these participants noted as follows:

*“Only the cabinet Secretary’s office uses social media for official communication specifically the Facebook and Twitter”.*



Another participant remarked as follows:

*“Our department uses the ministry’s twitter and Facebook account, even as such, you must be an authorized person to use the accounts.”*

Two participants stated that they use desktops in offices for official work such as storing documents electronically. Following are the participants’ remarks:

*“We use desktops for official work, furthermore, its hard disk has a large space for document storage”.*

*“As you can see, at least there is a computer in every office, we use these desktops for our official work especially for storing our documents”.*

A participant stated that they use computer servers to store reports. However, the participant was quick to state that at the time of conducting this study the servers had broken down. The participant remarked as follows: *“We use computer servers to store reports however at the moment it is out of service”.*

The findings demonstrate that the State Department of Infrastructure was using emails, information management systems, ministry’s website, Twitter, Facebook, Microsoft office, desktop and computer servers for knowledge sharing and storage. Some of the ICTs used for knowledge management processes include: intranet, internet, document management systems, expert systems, communication, and collaboration systems. Other ICTs include: content management systems, Facebook, Twitter, blogs, wiki and LinkedIn (Alavi and Leidner 1999; Jackson1998; Tyndale 2002; Liao 2003; Fombad 2008; Uriarte 2008; Dalkir 2011; Nazim and Mukherjee 2016; Semertzaki 2011; Young and Milton 2011).

Mosha (2017:115) categorizes ICTs for knowledge management processes as follows:

- Social networking sites (Facebook, MySpace, Google+ etc.);
- Professional networks (LinkedIn, Academia, Xing etc.);

- Researcher networks (Research Gate, The Science network, Library:-Library20, Webjunction etc.);
- Microblogging sites (Twitter);
- Authoring tools (blogs, wikis, content management system and content sharing);
- Sharing sites (Slideshare, Google Docs, Dropbox etc.);
- Productivity applications (RSS feeds);
- Online/social bookmarking (Google Bookmarks, Delicious, CiteULike and Stumble upon);
- Video and audio videos upload, sharing and management tools (YouTube, PhotoBucket and Metacafe);
- Audio sharing (Podcast);
- Image sharing (Picasa, Flickr and Photobucket);
- Audio sharing (Vodcast);
- Tagging.

Findings of the study indicated that ten out of the 21 participants reported using emails for knowledge creation and sharing. According to Dei (2017:218), email is being used for a multitude of different processes stretching from simple message transfers to storing documents and contact information, to filing bookmarks, literature references, contact information, and to managing tasks and reminders at Ghanaian universities.

Results of the study also found out that eight out of the 21 participants reported using mobile phones for communication. Dei (2017:218) states that the widespread availability of mobile devices offers enormous opportunities for knowledge management in organizations. Further, he adds that these technologies include handheld computers, MP3 players, notebooks, mobile phones and tablets. Some participants stated the following:

*“We communicate with regional staff on various projects either through short messages or through mobile conversations”.*

*“We are actually facilitated with mobile’s air time for communicating with other officers in the field”.*

Eight participants stated that the State Department of Infrastructure was using management information management systems for knowledge storage and sharing. Yasin (2013) and Kim (2013) acknowledge that organizations have information systems that store and share knowledge that they generate. It is important to note that several information systems are used at the State Department of Infrastructure. For example, integrated personnel and payroll database, government human resource information system and information finance management information system are national databases for use by all public employees.

Commending on information systems used at the State Department of Infrastructure, participants remarked as follows:

*“There are common information management systems that are used by all public sector organizations. These management information systems include integrated personnel and payroll database, government human resource information system, information finance management information system. These systems are used for knowledge storage and sharing”.*

*“A participant stated that integrated personnel and payroll database stores public service staff information such as date of employment, career progression, trainings undertaken and dates of retirement”.*

*“Government human resource information system stores and shares information to public employees. It stores public service personnel performance records, training gaps and stores staff pay slips. On sharing, Staff can download and upload information such as performance targets, human resource budgets and training schedules”.*

Study findings revealed that the State Department of Infrastructure uses its parent ministry's websites for knowledge storage and sharing. Han and Liu (2010) state that library websites act as information and knowledge dissemination space uses to provide information services to library users. On the use of websites, a study participant stated the following:

*“As a division we do not have a website, however, we use the ministry's website. The website is used for document storage and sharing. Members of the public use the ministry's website to download, for example, tender documents”.*

Study outcomes determined that the State Department of Infrastructure used Microsoft office applications for knowledge generation and sharing. Cawthorne (2016) says that a lot of the tools in Microsoft Office 365 environment support knowledge management work. For instance, Microsoft Outlook facilitates emailing, calendaring and basic task management. MS Office, the Office 365 subscription includes download and installation of full Office apps to work offline. Project, OneNote Online, Dynamics Customer Relationship management, Power Business Intelligence. SharePoint Online, One Drive, Yammer and Delve are the core online abilities. Planner —the latest tool has been added to the plethora of capabilities. Collectively these tools allow tackling of many problems from many different angles and occasionally and there is considerable overlap between the tool sets.

Findings of the research further revealed that the State Department of Infrastructure uses social media for communication. A participant stated the following: *“Only the cabinet Secretary's office uses social media for official communication specifically the Facebook and Twitter”*. This response is in line with the study's reviewed literature on the use of social media such as Facebook and Twitter for knowledge generation and sharing. It is significant to note that the Facebook and Twitter accounts used by the State Department of Infrastructure belong to its parent ministry.

From the study findings, the researcher noted that the State Department of Infrastructure uses desktop computers, computer servers and flash disks for knowledge storage. A participant stated that: “*We use desktops for official work, furthermore, its hard disk has a large space for document storage*”. Another participant commended as follows: “*We use computer servers to store reports*. This participant was however quick to state that the servers were broken down. Frost (2015) states information technology infrastructure to support knowledge management initiatives in organizations includes hardware, software applications and a platform to share knowledge.

Seemingly, the State Department of Infrastructure uses ICTs for knowledge management processes. However, the department should raise awareness on the use of ICTs for knowledge management processes. Further, there is need to increase use of Web 2.0 technologies such as wikis, blogs, intranet, Facebook, Twitter and E-learning for knowledge management processes. Mosha (2017:252) established that majority of librarians reported that through the use of Web 2.0 tools such as Skype, wikis and blogs, library staff can share their experiences and understanding about various activities conducted in the library. Staff can use social media to chat online with their peers on emerging issues and probably provide solutions to problems or create new knowledge. Furthermore, staff can also communicate with their stakeholders on a given subject, for example, frequently asked questions.

Apparently, the State Department of Infrastructure does not have automated systems that store its knowledge. Document management system can facilitate fast search and retrieval of departmental knowledge. Such a system can also store large amounts of knowledge and this can save on floor space. This is because if networked, information can be accessed by several users at different locations. Dewah (2011) indicates that technology, such as collaborative computing tools, electronic document management systems, knowledge servers, knowledge harvesting tools and search engines, enterprise knowledge portals, are critical enablers of knowledge management.

#### **4.3.3.3 How information and communication technologies enhance knowledge management processes at the State Department of Infrastructure**

Question fifteen of the interview guide sought to find out how ICTs enhance knowledge management processes at the State Department of Infrastructure. All the 21 participants stated that ICTs enhance knowledge management processes by improving access retrieval and sharing of knowledge, providing adequate storage space, assisting in monitoring (for example, road usage) and creation of knowledge. Following are some of the participants' remarks:

*“Information and communication technologies facilitates faster sharing of information to more people at different location”.*

*“It is faster to access and retrieve documents using computerized systems”.*

*“Information and communication technologies stores a lot of information on a minimal space”.*

*“Use of information management systems facilitates in monitoring purposes, for example, fleet management systems monitors the location of grander”.*

*“Use of mobile phones facilitates communication and sharing information with staff at remote areas”.*

*“Information and communication technologies such as Facebook, twitter facilitates online communication and can also be used for knowledge creation”.*

All the 21 participants agreed that ICTs enhance knowledge management processes at the State Department of Infrastructure. This finding is supported by McNabb (2006:45) who notes that in the public sector, ICTs enable organizations to develop and maintain the ability to identify relevant information that is needed for completion of their mission,

enhancing interagency collaborations, storage, organization and cataloguing invaluable knowledge so as it can be reused.

ICTs enhance knowledge management processes at the State Department of Infrastructure through faster sharing of knowledge, access and retrieval of documents, and saving on floor space through storage of a lot of knowledge. In addition, use of ICTs in knowledge management is useful for monitoring purposes in an organization, communication and knowledge creation. The researcher is of the opinion that the State Department of Infrastructure can leverage on its staff awareness that ICTs facilitate knowledge management processes of knowledge creation, storage and sharing.

#### **4.3.4 Theme four: Challenges experienced in the use of information and communication technologies for knowledge management processes**

Question sixteen of this study's interview guide sought to establish challenges experienced in the use of ICTs for knowledge management at the State Department of Infrastructure. Several challenges were identified by the study participants in regard to a wide range of areas of ICTs application in knowledge management processes.

Participants cited the following challenges experienced in the use of ICTs for knowledge management processes at the department under study:

- Resistance to use of ICTs;
- Inadequate computer skills among staff specifically on social media;
- Lack of a knowledge management policy to give guidance on how to manage knowledge using ICTs;
- Lack of an intranet at the organization;
- Lack of an automated registry and library system.

Several remarks from participants demonstrate the challenges facing the use of ICTs in knowledge management processes at the State Department of Infrastructure. Here are select participants' comments on this issue:

*“Inadequate staff training on the use of information and communication technology tools and software for knowledge management”.*

*“The library is disorganized and not automated hindering storage, access and retrieval of knowledge”.*

*“Most of the State Department of Infrastructure reports are stored in offices making their accessibility for use impossible”.*

*“Lack of division’s intranet hinders real-time communication, knowledge storage, creation and document sharing”.*

*“Staff have not fully embraced information and communication technology. There is also fear of failure by using information technology”.*

*“Currently there is no a qualified information and communication technology personnel in the division to assist with information and communication technology issues”.*

*“The registry is also not automated hindering faster retrieval of files and reports”.*

*“Resistance to use information and communication technologies by older engineers”.*

*“Inadequate training on how to use the information and communication technologies tools, this actually make the engineers to shy away from using information and communication technology”.*

*“The unwillingness to use information and communication technologies, change management on use of information and communication technologies for service delivery is low”.*



*“There are few computers, the registry is not automated and computer illiteracy by most staff. “Outdated and slow facilities hindering access, storage, sharing and retrieval”.*

*“There is a low attitude on embracing information and communication technology by department’s personnel”.*

*“There is no position of a knowledge management personnel in the public service scheme of service”.*

*“Lack of an inventory and disposal, spare and consumable system”.*

The challenges identified in this study in regard to the use of ICTs in knowledge management processes reflect those identified by other authors. For instance, Dei (2017:170) and Mosha (2017:214) identified challenges of using ICTs for knowledge management in universities in Ghana and Tanzania respectively. They identified the following challenges: poor technological infrastructure and systems; limited access to internet bandwidth and connectivity; resistance to change (adoption of technology) by some senior staff; low level of computer and technological literacy among some faculty members. Other challenges were: high cost of acquiring and implementing knowledge management and ICT systems; improper implementation of technology; non-existence of platforms and media for knowledge creation and sharing among senior and junior members of staff.

The State Department of Infrastructure probably lacks strategies such as staff training on the use of ICTs for knowledge management processes and raising awareness on the role of ICTs for knowledge management processes. It is also likely that there is lack of change management strategy to manage resistance to ICTs for knowledge management processes. Probably, resistance to the use of ICTs for knowledge management processes, inadequate computer skills specifically on social media, and lack of a knowledge management policy

on how to manage knowledge could be hindering use of ICTs for knowledge management processes at the State Department of Infrastructure.

#### **4.3.5 Theme five: Suggestions on the use of information and communication technologies for knowledge management processes at the State Department of Infrastructure**

The last question of the study's interview guide sought participants' views on the use of ICTs for knowledge management processes at the State Department of Infrastructure. Participants' recommendations are captured in the following remarks:

*“There should be an information and communication technology expert to manage for example the broken server”.*

*“The library should be reorganized and automated”.*

*“The registry should be automated”.*

*“Every personnel in the department of infrastructure to be trained on how to use information and communication technology for service delivery especially the social media, Facebook, twitter, Skype and how to attach document for sharing”.*

*“There should be an automated centralized knowledge base for the State Department of Infrastructure”.*

*“The department should embrace information and communication technology fully so as to facilitate prediction and mitigation of incidences, and also collect and analyze data efficiently and effectively”.*

*“State Department of Infrastructure should introduce eLearning and use of smart class”.*

*“State Department of Infrastructure should appoint a team to spearhead development of a knowledge management policy guiding on information and communication technologies for knowledge management processes”.*

*“State Department of Infrastructure should integrate all standalone databases”.*

*“State Department of Infrastructure should develop its intranet that can be used by its staff for knowledge creation, storage and sharing”.*

*“To have a knowledge management officer to advice on how to manage organizational knowledge”.*

*“To train State Department of Infrastructure staff on knowledge management”.*

*“State department should develop an automated equipment hiring system”.*

*“Each division to have its own website and intranet. This will create a platform where we can be reached both internally and externally”.*

From the participants’ statements, the researcher identified recommendations on the use of ICTs for knowledge management processes at the State Department of Infrastructure. These recommendations were as follows:

- Automation of the department’s registries and library;
- Formulation of a policy guiding the use of ICTs for knowledge management processes;
- Staff training on knowledge management concepts and use of ICTs for knowledge management processes;
- Appointment of an officer to advise on knowledge management at the department;

The summary of the foregoing recommendations by participants confirms that there were challenges on the use ICTs for knowledge management processes at the State Department

of Infrastructure. Seemingly, these suggestions can be solutions to challenges stated earlier and possibly if implemented enable the department manage its knowledge effectively.

#### **4.4 Summary of the chapter**

The findings presented in this chapter were derived from interview responses. The results were presented under five themes that were based on the study's objectives. The main issues that emerged from the findings of this study can be summarized as follows according to the objectives of the study:

- i. To establish the level of knowledge management awareness at the State Department of Infrastructure.
  - There is knowledge management awareness at the State Department of Infrastructure. However, there is need to increase this awareness among the staff.
- ii. To find out knowledge management processes at the State Department of Infrastructure.
  - There are knowledge management processes at the State Department of Infrastructure. Nevertheless, there is need to raise awareness on how to create knowledge within the department.
- iii. To identify types of ICTs used for knowledge management processes at the Department of Infrastructure.
  - The State Department of Infrastructure uses ICTs for knowledge management. However, study participants were not aware on how these ICTs are used for knowledge management processes;
  - There need to raise awareness on the use of ICTs for knowledge management processes at the State Department of Infrastructure.
- iv. To identify challenges experienced by Department of Infrastructure in the use of ICTs for knowledge management

- There was inadequate staff training on the use of ICT tools and software for knowledge management processes at the department;
- The department's library was disorganized and not automated and this was a hindrance to the storage, access and retrieval of knowledge;
- Lack of intranet in the various divisions of the department hinders real-time communication, knowledge storage, creation and document sharing;
- Staff have not fully embraced ICTs ;
- The registry is not automated and this impedes faster retrieval of files and reports.

The next chapter contains the summary of major findings, recommendations and conclusions of the study.

## **CHAPTER FIVE**

### **SUMMARY OF MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.0 Introduction**

The aim of this study was to investigate ICTs for knowledge management processes at the State Department of Infrastructure. The findings and interpretations of this study were presented in chapter four. This chapter discusses; summary of major findings, conclusions, recommendations and implication for policy, theory and practice. The study was guided by knowledge creation SECI model and Web 2.0 driven SECI model.

#### **5.1 Summary of major findings**

This section presents the major findings of the study. These results were presented according to the study's objectives given as follows:

- i. To establish the level of knowledge management awareness at the State Department of Infrastructure;
- ii. To find out knowledge management processes at the State Department of Infrastructure;
- iii. To identify types of ICTs used for knowledge management processes at the State Department of Infrastructure; and
- iv. To identify challenges experienced by State Department of Infrastructure in the use of ICTs for knowledge management.

##### **5.1.1 Knowledge management awareness at the State Department of Infrastructure**

The State department of Infrastructure participants defined various knowledge management concepts such as knowledge, knowledge management, explicit and tacit knowledge. Phrases used to define knowledge were in line with definitions provided by (Nonaka and Takeuchi 1998:8; Davenport and Prusak 1998:5; Coleman and Casselman 1998: 938) in the study's literature review.

Explicit knowledge definition was in line with the definitions advanced by various scholars in this study's literature review (for example, Nonaka 1995; Polanyi 1966, 1998; King 2009; Alavi and Leidner 2001). Participants defined the term 'explicit knowledge' using phrases of the term 'tacit knowledge' matching those provided in this study's literature review by various author (for example, Polanyi 1966, 1998; Nonaka and Takeuchi 1998; Serban and Laun 2002).

Participants cited road maps, manuals, policies, standards, circulars, work schedules, minutes, technical know-how, consultations with fellow engineers and colleagues' technical knowledge as knowledge available at the State Department of Infrastructure. This is in agreement with King (2009:4) as reviewed in this study's literature review. The author notes that knowledge-related assets include knowledge in the form of printed documents, such as patents and manuals and knowledge stored in electronic repositories such as "best practices" database.

Participants stated that knowledge and knowledge management are essential for decision making, reference, monitoring, research, project implementation, business continuity, creativity and innovation. It is acknowledged that knowledge and knowledge management improves organizational performance through increased efficiency, productivity, quality and innovation (Biygautane and Al-Yahya 2010; Shajera and Al-baski 2014).

#### **5.1.2 Knowledge management processes at the State Department of Infrastructure**

Findings of the study showed that inductions and on-job training and technical meetings were frequent ways of knowledge creation at the State Department of Infrastructure. Organizational knowledge was created through mentorship, research, intranet and provision of laboratories for research. The results of the study revealed that registries and computer servers were mainly used for knowledge storage. It was established that document sharing, training and meetings were the most common methods used for sharing knowledge at the State Department of Infrastructure. Study findings also revealed that the State Department of Infrastructure codifies knowledge through reports, manuals, forms, circulars, databases and conversations. It was pointed out that reports, training, registries,

archives, databases, backups, mentoring and coaching, succession planning and contracting retirees were used for knowledge retention.

### **5.1.3 Types of information and communication technologies used for knowledge management processes at the State Department of Infrastructure**

Study findings revealed that the State Department of Infrastructure uses ICTs for knowledge sharing and storage. Emails and mobiles phones were most preferred for document sharing and conversation. Further, it was established that the department uses desktop computers, computer servers and flash disks for knowledge storage. Results from the study further indicated that the State Department of Infrastructure uses emails, mobile phones, information systems, website, Microsoft Office, social media, desktop computers and computer servers.

It was also established that the department was not using ICTs for knowledge creation. The department uses its parent ministry's website for document sharing and its Facebook and Twitter account for communication. Social media (blogs, Facebook, twitter, wikis) facilitates people to interact online. According to the study's web 2.0 SECI model, social media provides great opportunities to exchange tacit knowledge. Wegner *et al* (2014:34) note that Web 2.0 provides a platform for human interaction and collaboration where individuals may be virtually co- present and observe each other.

The study results show that the department's integrated personnel and payroll database, government human resource information system, and information finance management information system were not used to store knowledge generated at the State Department of Infrastructure. Kim (2013:34) notes that the Korea custom service uses a knowledge management portal system to integrate and share all of the internally and externally amassed information.

It was further found out that ICTs enhance knowledge management processes at the State Department of Infrastructure. ICTs enhanced faster sharing of knowledge, access and retrieval of documents and mass storage of knowledge (saving on floor space). Additionally, ICTs were used for monitoring purposes, communication and knowledge



creation. These findings are in line with the study's literature review. Semerrzaki *et al* (2011) confirmed that new technologies offer unprecedented possibilities for human creativity, global communication and access to information.

#### **5.1.4 Challenges experienced by State Department of Infrastructure in the use of information and communication technologies for knowledge management**

Findings revealed that there were challenges experienced in the use of ICTs for knowledge management at the State Department of Infrastructure. Some of these challengers were: staff resistance to the use of ICTs and inadequate computer skills among staff specifically on how to use social media. The department also lacks a knowledge management policy to give guidance on how to manage knowledge using ICTs. Other challenges identified were lack of an organizational intranet, an automated registry and library system. Further, the department lacks a knowledge management officer-in charge to advice on ICTs for knowledge management processes.

### **5.2 Conclusions**

The aim of this study was to investigate ICTs for knowledge management processes at the State Department of Infrastructure. This aim was realized through relevant data collected, analyzed, presented and interpreted in previous chapters of this research. The State Department of Infrastructure uses emails, mobiles phones, desktops, computer servers and flash disks for knowledge management processes. However, the department was not using ICTs provided by this study's Web 2.0 driven SECI model for knowledge management processes such as blogs, wikis, LinkedIn, Facebook, and Twitter.

From the findings of the study, several conclusions were drawn. Firstly, participants at the State Department of Infrastructure were aware of the meanings of knowledge management concepts, namely: knowledge, knowledge management, explicit and tacit knowledge. However, there is need for the department to raise staff awareness on these knowledge management concepts and to provide their working definitions.

Participants were aware of the types of knowledge available at the State Department of Infrastructure. For instance, they identified road maps, manuals, policies, standards, circulars, work schedules, minutes, technical know-how and consultations with fellow engineers. Participants were also aware of the importance of knowledge and knowledge management for decision making, reference, monitoring, research, project implementation, business continuity, creativity and innovation for the attainment of the department's objectives. Nevertheless, there is need to raise awareness on ways in which knowledge management is a strategic objective at State Department of Infrastructure.

Secondly, knowledge management processes at the State Department of Infrastructure comprised of knowledge creation, codification, retention, sharing and storage. Knowledge creation is managed through induction and on-job training, technical meetings, mentorship, intranet and provision of laboratories for research. Knowledge storage is managed through registries, archives, libraries, offices, computer servers, external hard drives, and parent ministry's website.

The State Department of Infrastructure has employed various methods of sharing knowledge such as document sharing, mentoring, training, meetings, industrial attachments and conversations. The department codifies its tacit through brainstorming, face-to-face and telephone conversations. Explicit knowledge is codified through reports, manuals, minutes, forms, circulars and databases. The State Department of Infrastructure use registries, reports, training, archives databases and backups. The department uses mentoring and coaching, succession planning and contracting retirees for knowledge retention.

The foregoing conclusions are in agreement with the study's knowledge creation SECI model. However, there is no knowledge management documentation at the State Department guiding on which knowledge to be managed and how it can be managed. Therefore, there is need to raise awareness on how knowledge is to be managed at the State Department of Infrastructure. Seemingly, explicit knowledge codification is practised more compared to tacit knowledge codification.

Thirdly, the State Department of Infrastructure has a functional ICT infrastructure. Emails and mobiles phones were the most preferred means for document sharing and conversation respectively. The department uses desktop computers, computer servers and flash disks for knowledge storage. The State Department of Infrastructure does not have automated systems that store its knowledge. Further, the department does not have its own organizational website and social media platforms such as Facebook and Twitter accounts.

The State Department of Infrastructure does not use ICTs provided by this study's Web 2.0 driven SECI model for knowledge management processes. Additionally, there is no knowledge management strategy and policy guiding the use of ICTs for knowledge management processes. Thus, there is need to raise awareness on the use of ICTs especially Web 2.0 for knowledge management processes at the department. Formulation of knowledge management strategy and policy can go a long way in demonstrating the department's commitment to knowledge management as key corporate objective.

Lastly, the study findings established that there were challenges experienced in the use of ICTs for knowledge management processes at the State Department of Infrastructure. The department probably lacks strategies to realize full exploitation of ICTs such as training of staff on the use of ICTs for knowledge management processes and raising awareness on the role of ICTs for knowledge management processes. It is also likely that there is lack of a change management strategy to manage resistance to the adoption and use of ICTs for knowledge management processes at the State Department of Infrastructure.

### **5.3 Recommendations**

Based on the findings of the study, several recommendations were suggested in order to enhance ICTs for knowledge management processes at the State Department of Infrastructure. The Public Service Commission of Kenya and Information and Communication Technology (ICT) Authority are probably bound to ensure ICTs for knowledge management processes are implemented in public sector organizations.

The study's recommendations were based on the study's findings and focused on the following:

- Knowledge management awareness at the State Department of Infrastructure;
- Knowledge management processes at the State Department of Infrastructure;
- ICTs for knowledge management processes at the State Department of Infrastructure;
- Challenges experienced in the use of ICTs for knowledge management processes.

### **5.3.1 Recommendations on improving the level of knowledge management awareness at the State Department of Infrastructure**

The State Department of Infrastructure, Support services division, should identify and train all staff on knowledge management concepts. In this regard, the department should first identify its knowledge management training needs. The department should adhere to the Public Service Commission of Kenya's human resource and development policy (2015:7). The policy states that all training in public service organizations shall be based on comprehensive Training Needs Assessments (TNA) to be conducted every three (3) years or as the need arises.

The proposed knowledge management training content in the department could probably comprise of basic concepts of knowledge management such as data, information, knowledge, and knowledge management, tacit and explicit knowledge. Such training should also incorporate content on categories and sources of knowledge and their examples, and benefits of knowledge management in their department. The researcher further recommends that sensitization of knowledge management as a strategic objective of the department needs to be carried out to all staff and other stakeholders. This will ensure that all staff are aware of their role as far as knowledge creation, sharing and storage, retention and codification are concerned.

### **5.3.2 Recommendations on improving knowledge management processes at the State Department of Infrastructure**

The Public Service Commission of Kenya should develop knowledge management strategy and policy to be used by all public sector organizations in Kenya. The State Department of

Infrastructure is a public sector organization and falls under this commission. The State Department of Infrastructure, Support services division, can then cascade the formulated government knowledge management strategy and policy. However, it is important that even in the absence of the Public Service Commission of Kenya's initiatives, the department can become strategic and competitive and formulate its own knowledge management strategy and policy.

The Public Service Commission of Kenya (2015:15-17) identifies knowledge management as one of its human resource and development and capacity building approach. It has further committed itself to building the capacity of public servants on knowledge management techniques, procedures, processes and encourage a culture of reading. The strategy should address issues such as leadership, people, processes and technology.

The recommended Public Service Commission of Kenya government sector-wide knowledge management strategy can draw lessons from a study by Ramohlale (2014:184). Ramohlale's study recommended to the South Africa's Department of Defense the following elements for their knowledge management strategy: objectives, problems that will be addressed, approach, plan, budget, cost benefit analysis, people, and process, data, and technology assessments and measurements. Syed-Ikhsan and Rowland (2005:243) add that a knowledge management strategy enables employees to know their individual roles or their roles with other employees, and keeps them aware of the kinds of knowledge that need to be managed and shared by them.

Knowledge management policy proposed in this study should address, among others: knowledge management assessment needs, knowledge management awareness, categories of knowledge, knowledge management processes, ICTs, culture and change management. Ramohlale (2014:184) states that within a knowledge management strategy there is need to formulate a knowledge management policy. Such a policy can be implemented and altered to meet the objectives and operations of the specific organization for which it is designed. In the case of Ramohlale (2014) it was the South African Department of Defense

whose proposed knowledge management policy could define under what circumstances, with whom, and how the department's workers should share knowledge.

Based on the findings of this study, the researcher recommends that the State Department of Infrastructure, Support services division, should carry out a knowledge mapping exercise to establish its ICTs for knowledge management processes needs. Mosha (2017:287) explains that knowledge mapping is used to establish knowledge needs in the organization. Such mapping also ensures the flow of organizational knowledge and raises the accessibility of knowledge sources to library users. Knowledge mapping should inform preparation of a knowledge management strategy which was identified as lacking at the State Department of Infrastructure.

The State Department of Infrastructure should encourage staff to create knowledge through informal forums such as tea breaks. Mungai (2014:286) recommends having designated sections where employees can interact during lunch and tea breaks. In this arrangement, there is need to ensure that water points are centralized and shared by all staff. This encourages informal interactions between the management, mentors and researchers. The author also recommends organizing monthly team building and 'happy hour' sessions on to facilitate creation of tacit knowledge. The State Department of Infrastructure, support services division, should consult with other similar organizations in Kenya and other countries in East Africa in order to learn more on knowledge management processes.

### **5.3.3 Recommendations on information and communication technologies for knowledge management processes at the State Department of Infrastructure**

ICT Authority of Kenya should advise public sector organizations on ICTs for knowledge management processes. According to ICT Human Capital and Workforce Development Standard (2016:7), the ICT Authority has express mandate to, among others, set and enforce ICT standards and guidelines across all aspects of ICT including systems, infrastructure, processes, human resources and technology for the public service. State Department of infrastructure should liaise with the ICT authority of Kenya on advice on ICTs for knowledge creation, storage and sharing.

The State Department of Infrastructure should increase its use of Web 2.0 technologies especially those that are geared towards knowledge creation such as wikis, blogs, intranet and web conferencing. The department should create its own website, Facebook and tweeter account.

The State Department of Infrastructures should create an intranet so as to leverage on its ICT infrastructure for knowledge management processes. Intranets facilitate information storage, communication and information sharing among organizational members. Intranets accommodate some Web 2.0 technologies such as wikis, blogs and video conferencing for knowledge creation and sharing.

ICT Authority of Kenya should identify e-learning as a training tool by all public sector organizations. The State Department of Infrastructure should use an e-learning platform for its training. E-learning provides an opportunity for self-paced learning and stores knowledge. E-learning permits participants to acquire knowledge, pass it from one person to another, apply it to organizational problems/opportunities, and store that knowledge for future use (Khademi *et al* 2011; Ho 2010).

From the findings of the study, it is clear that most of the records at the State Department of Infrastructure are in paper form and are managed in both centralized and decentralized registry systems in all departmental divisions. Findings also revealed a preference for electronic records management was expressed by most staff in the department. Therefore, the researcher recommends digitization of records at the State Department of Infrastructure.

Digitization of records, can enhance the State Department of Infrastructure's records uniformity, document controls, sharing and security. Digitization of records will also include automation of work flows which are currently manual and this in return will increase efficiency. This will enhance collation of records scattered across different locations and also deal with the problem of deterioration. In adopting the study's recommendation of automating its records, the State Department of Infrastructure should

adhere to Electronic Records and Data Management Standard (2016). This standard provides compliant requirements for management of government records and data.

The State Department of Infrastructure should also automate its library services. The department has a library in which its organizational reports, drawings, maps manuals and standards are stored. These documents are important knowledge sources.

ICT Authority of Kenya should prepare a policy document guiding on ICTs for knowledge creation, storage and sharing to be implemented by public sector organizations in Kenya. State department of infrastructure, support services division, should come up with its knowledge management policy in consultation with the ICT authority. Such policies ensure that technologies are not misused or underutilized.

#### **5.3.4 Recommendations on challenges experienced in the use of information and communication technologies for knowledge management**

Findings revealed that there is inadequacy in computer skills specifically on how to use social media. Therefore, the State Department of Infrastructure, support services division, should train its staff on how to use various social media platforms for work-related functions. For example, Facebook, LinkedIn, Twitter, blogs and wikis. In addition, the department's staff should be trained on the use of Skype, emails, and Microsoft applications (such as SharePoint that allows for collaborative working).

Mosha (2017:297) noted that training programmes based on access and use of Web 2.0 tools must be organized and conducted regularly. Such programmes equip library staff with knowledge and skills on how to access and use Web 2.0 tools for innovative service delivery in academic libraries and knowledge management processes. A study by Mungai (2014:118) recommended that the employees of KIPPRA should be trained on the use of the technological platforms available and their relevance in tacit knowledge management.

From the preceding, it is important that the State Department of Infrastructure, support services division, should identify its ICT training needs and seek to meet them by offering



relevant programmes for its staff. The department should also put mechanisms in place that will help its staff be aware of the latest trends in ICTs. Such awareness can enable the staff of the department identify ICTS that could benefit the organization in its endeavor to manage its knowledge effectively.

The Public Service Commission of Kenya should create a position within the public service for one who will be managing knowledge in the public sector and spell out its job descriptions. This position can be also be created in government ministries and parastatals. The State Department of Infrastructure should appoint a Chief Knowledge Officer to be responsible for knowledge created, stored and shared in the department. Mungai (2014:109) recommended that a knowledge manager who is the knowledge management initiative champion at KIPPRA ensures that tacit knowledge concept is clearly outlined and incorporated in the organization's daily activities. Mosha (2017:290) noted that Chief Information Officer was conspicuously a high management position that emerged successively in government departments and large organizations in the Western countries in the 1980s.

#### **5.4 Suggestions for further research**

This study investigated ICTs for knowledge management processes at the State Department of Infrastructure. From the findings of the study, a number of issues that would require further research. Sauroumbe (2016:337) and Maluleka (2017:195) acknowledge that it is not possible to study everything in any research.

The researcher recommends further study on ICTs for knowledge management processes in all the five departments of the Ministry of Transport, Infrastructure, Housing, and Urban Development in the government of Kenya. The study should cover all staff and not just heads of sections as the current research did. Nationwide similar studies should be conducted focusing on all national government ministries, parastatals, and county governments so as to yield conclusive results that can be generalized to the public sector in Kenya. The studies should involve both the staff and users of public sector organizations based on multiple data collection methods. The aforesaid recommended studies emanate

from the limitations of the current research as it was restricted itself to State Department of Infrastructure in the Ministry of Transport, Infrastructure, Housing, and Urban Development with four more State departments. This study used interviews as data collection method which are prone to biasness. Disadvantages of using interviews are that researcher's presence may result into bias responses (Creswell 2009:179). Future studies should triangulate through use of more than one data collection instruments such as questionnaires, observations and document analysis.

This study identified a list of ICT tools used for knowledge management processes. The researcher recommends that future studies can focus on in-depth investigation on how ICTs are utilized for knowledge management in public sector organizations in Kenya and their impact on the performance and service delivery of these institutions. This is important in determining how adoption of ICTs impacts on knowledge management and subsequently public sector organization's performance and service delivery.

### **5.5 Implications for policy, theory, and practice**

For increased productivity and efficient service delivery, the government of Kenya has adopted e-government. Survival of e-government is dependent on knowledge availability. Knowledge management provides the overall strategy to manage the content of e-government by providing knowledge, organizing tools and techniques, monitoring up datedness of knowledge contents and availing all necessary information to citizens (Gupta and Singh 2014:1639). The findings and recommendations have implications to policy, theory and practice in relation to use of ICTs for knowledge management in the public sector.

#### **Implications for policy**

The results of the study can be used to influence policy on knowledge management in the public sector in Kenya. The Public Service Commission of Kenya can use the study findings and recommendations to develop a knowledge management policy to be used by all public sector organizations nationally. The policy should provide guidance on knowledge management awareness, which knowledge to be managed and how it will be

managed, ICTs to be used for knowledge management processes and identify the people to manage knowledge.

ICT Authority of Kenya can use the study findings and recommendations to prepare a policy document guiding on ICTs for knowledge creation, storage and sharing to be implemented by public sector organizations in Kenya. The policy should provide guidance on how the ICTs will be used for knowledge management. The policies developed by Public Service Commission of Kenya and ICT authority can then be adopted by public sector organizations which base their internal knowledge management policies on them.

### **Implications for theory**

The study findings contribute to the understanding of the use of ICTs in knowledge management processes in the public sector in Kenya. This is critical given the government of Kenya efforts to provide e-government services. The results of this study have been used to test the applicability of the knowledge creation theory (SECI) by Nonaka and Takeuchi (1995) and The Web 2.0 driven SECI model advanced by Chatti *et al* (2007). From the study findings, it was noted that there was limited use of Web 2.0 tools in knowledge management at the State Department of Infrastructure. Prior studies internationally and locally have generally focused on knowledge management with a limited focus on ICTs as enablers of knowledge creation, storage, and sharing. Therefore, this study's results provide valuable information that can be used by students and scholars interested in the use of ICTs for knowledge management in the public sector in developing countries such as Kenya.

### **Implications for practice**

The study findings revealed that there was limited use of Web 2.0 tools in knowledge management processes at the State Department of Infrastructure. The implication of this is that public sector organizations such as the department under study should in an effort to improve their knowledge management processes adopt Web 2.0 tools such as document management and e-learning systems, blogs, wikis, expert directories, intranet, RSS feeds, mashup technology and mobile devices. These tools enable efficient knowledge creation, storage and sharing between government employees, other agencies and citizens. Further, ICTs such as e-learning facilitates employees' competency development. Consequently if

this is adopted, it will enhance decision-making and problem-solving, and overall public sector performance. The State Department of Infrastructure and other public sector organizations in Kenya should endeavor to create awareness of and train their staff on the use of ICTs especially Web 2.0 for use in facilitating knowledge management processes at the workplace.

## **5.6 Final conclusion**

This study investigated ICTs for knowledge management processes at the State Department of Infrastructure. The study established the following: participants were aware of key knowledge management concepts, available categories of knowledge, importance of knowledge and knowledge management in the attainment of the department's objectives. It was also established that knowledge management processes at the department consist of knowledge creation, storage, sharing, retention and codification. The State Department of Infrastructure has a functional ICT infrastructure. However, this infrastructure is underutilized for knowledge management processes. The study established that there were several challenges experienced in the use of ICTs for knowledge management processes at the State Department of Infrastructure. The challenges pertain to among others, staff resistance to ICTs and inadequacy of skills, lack of a knowledge management policy and designated staff for knowledge management.

The study has made several recommendations that might guide the State Department of Infrastructure on using ICTs for knowledge management processes. There should be an increase in the use of Web 2.0 technologies, collaborative content systems, intranet, and e-learning technologies. There is also need to formulate a policy to guide the department on ICTs for knowledge management processes. There is need to raise staff awareness on the use of ICTs for knowledge management processes. The department's personnel should be trained on how to use ICTs for knowledge management processes especially social media. Lastly, there should be an automated centralized knowledge base for the State Department of Infrastructure. The adoption of these recommendations can enable the State Department of Infrastructure acquire, implement and use ICTs for its knowledge management processes.

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## APPENDICES

### APPENDIX I: PERMISSION LETTER TO CONDUCT RESEARCH AT THE STATE DEPARTMENT OF INFRASTRUCTURE



**MINISTRY OF TRANSPORT, INFRASTRUCTURE, HOUSING & URBAN  
DEVELOPMENT  
STATE DEPARTMENT OF INFRASTRUCTURE**

Telephone: (020) 2723232  
Fax: (020) 2719658  
Email: [ps@infrastructure.go.ke](mailto:ps@infrastructure.go.ke)  
Website: [www.transport.go.ke](http://www.transport.go.ke)

WORKS BUILDING  
NGONG ROAD  
P.O. Box 30260 - 00100  
NAIROBI

**Ref.** MOTIH&UD/Conf. E.21/5 Vol. III (58)

**Date:** 2<sup>nd</sup> October, 2017

**Nancy Mbugua**  
P O Box 271-00600  
**NAIROBI**

**REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT THE STATE  
DEPARTMENT OF INFRASTRUCTURE**

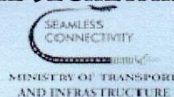
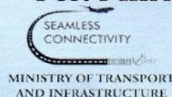
Reference is made to your letter dated 27<sup>th</sup> September, 2017 on the above subject.

This is to inform you that authority has been granted for you to conduct research on how this State Department is employing information and communication technologies for knowledge management processes.

It is noted that you have selected this State Department because we have adopted e-governance for service delivery to the public.

Please ensure that all the rules and regulations that govern the conduct of Research are observed.

**Dr. Lydia Muriuki**  
**For: PRINCIPAL SECRETARY**



**APPENDIX II: INTERVIEW GUIDE**

**INFORMATION AND COMMUNICATION TECHNOLOGIES FOR  
KNOWLEDGE MANAGEMENT PROCESSES IN THE PUBLIC SECTOR IN  
KENYA: A CASE STUDY OF THE STATE DEPARTMENT OF  
INFRASTRUCTURE**

**Interview Guide**

<b>Question Route</b>	<b>Question No.</b>	<b>Question</b>
<b>Opening</b>	1.	What is your name (optional), section, position and the duration worked at the State Department of Infrastructure?
<b>Knowledge management awareness</b>		
<b>Key questions</b>	2.	What is your understanding of the following concepts a) Knowledge b) Knowledge management c) Explicit knowledge d) Tacit knowledge
	3.	What are the different types of knowledge that you are aware of?
	4.	What types of knowledge are available at State Department of Infrastructure?
	5.	In what ways is knowledge management included as a strategic objective of the State Department of Infrastructure as strategic plan?
	6.	How is knowledge and knowledge management essential in the attainment of the State Department of Infrastructure objectives?

<b>Knowledge management processes</b>		
	7.	In what ways does the State Department of Infrastructure manage its knowledge?
	8.	What mechanisms have been put in place at State Department of Infrastructure to facilitate the creation of the different types of knowledge?
	9.	How does the State Department of Infrastructure codify its knowledge?
	10.	How does State Department of Infrastructure retain its knowledge?
	11.	How does the State Department of Infrastructure store the different types of knowledge?
	12.	How does State Department of Infrastructure share the different types of knowledge in the Department?
<b>Information and communication technologies used for knowledge management processes</b>		
	13.	How does the State Department of Infrastructure use information and communication technologies for the different knowledge management processes?
	14.	What are the different types of information and communication technologies that state department of uses for the different knowledge processes
	15.	How does information and communication technologies enhance the different knowledge management processes
<b>Challenges experienced in the use of information and communication technologies for knowledge management processes.</b>		
	16.	What will you consider as the factors that hinder the use of information and communication technologies for knowledge management processes at the State Department of Infrastructure? Explain



<b>Ending question</b>	17.	Do you have any other contribution to make in regards to the use of ICT for knowledge management at the State Department of Infrastructure

### **APPENDIX III: PARTICIPANT INFORMATION SHEET**

17/10/2017

**Title: Information and Communication Technologies for knowledge management processes in the public sector in Kenya: a study at the State Department of Infrastructure.**

**Dear Prospective Participant**

My name is Nancy Mbugua and I am doing research with Prof. MC Fombad, a senior lecturer in the Department of information science towards a Masters of Art in Information Science at the University of South Africa. We are inviting you to participate in a study entitled Information and Communication Technologies for knowledge management processes in the public sector in Kenya: a study at the State Department of infrastructure.

**WHAT IS THE PURPOSE OF THE STUDY?**

I am conducting this research to find out Information and Communication Technologies for knowledge management processes: a study at the State Department of infrastructure.

**WHY AM I BEING INVITED TO PARTICIPATE?**

You were chosen to participate in this study for you are involved in decision making on how knowledge is created, stored and disseminated in your organisation. Your personal information was availed by the State Department of Infrastructure, Principal Secretary's office.

**WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?**

Your role in this study is to provide information on information and communication technologies for knowledge management processes through face-to-face interview. The interview will take a duration of seven days, one hour per respondent.

Questions to be answered in the study will focus on; the level of knowledge management awareness, knowledge management processes, information and communication technologies for knowledge management processes and challenges of using ICTs for knowledge management processes.

### **CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?**

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. However, it will not be possible to withdraw after the interview.

### **WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?**

The study will be of benefit to your organisation as its findings will assist in identifying information and communication technologies for managing your knowledge for improved service delivery.

### **ARE THERE ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?**

There are no possible or reasonably foreseeable risks of harm or side-effects to the potential participants for participating in the research project.

### **WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?**

Your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

### **HOW WILL THE RESEARCHER (S) PROTECT THE SECURITY OF DATA?**

Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet at home for future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Hard copies

will be shredded and/or electronic copies will be permanently deleted from the hard drive of the computer through the use of a relevant software programme.

### **WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?**

There will be no payment or reward offered, financial or otherwise. However a copy of research findings will be submitted to the organisation.

### **HAS THE STUDY RECEIVED ETHICS APPROVAL**


This study has received written approval from the Research Ethics Review Committee of the College of Human Sciences, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

### **HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?**

If you would like to be informed of the final research findings, please contact Nancy Mbugua on 0722910299 or [infonancy11@gmail.com](mailto:infonancy11@gmail.com). The findings are accessible for five years. Should you require any further information or want to contact the researcher about any aspect of this study, please contact Nancy Mbugua on 0722910299 or [infonancy11@gmail.com](mailto:infonancy11@gmail.com).

Should you have concerns about the way in which the research has been conducted, you may contact Prof. MC Fombad, telephone number, 0124294069, Fax, 0124293792/8250, or email, [fombamc@unisa.ac.za](mailto:fombamc@unisa.ac.za).

Thank you for taking time to read this information sheet and for participating in this study.



Nancy Mbugua

#### APPENDIX IV: CONSENT TO PARTICIPATE IN THIS STUDY

I, \_\_\_\_\_ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

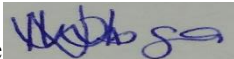
I agree to the recording of the face to face interview.

I have received a signed copy of the informed consent agreement.

Participant Name and Surname..... (please print)

Participant Signature.....Date.....

Researcher's Name and Surname      Nancy Mbugua

Researcher's signature  . Date... 16/10/2017.....